4762

THE

JOURNAL

OF

GAS LIGHTING,

WATER SUPPLY,

Etc.

VOL. XCIV.

APRIL TO JUNE, 1906.

LONDON:

WALTER KING,

11, BOLT COURT, FLEET STREET, E.C.

THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. XCIV. No. 2238.] LONDON, APRIL 3, 1906. [58TH YEAR. PRICE 6d.

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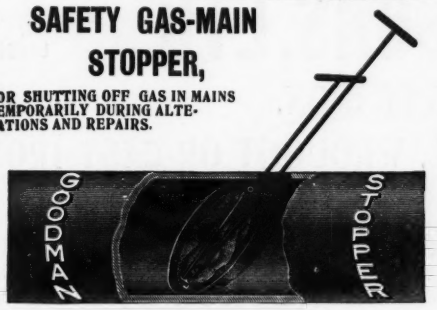

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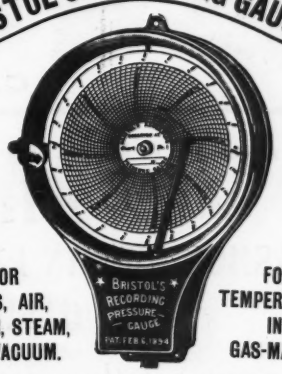

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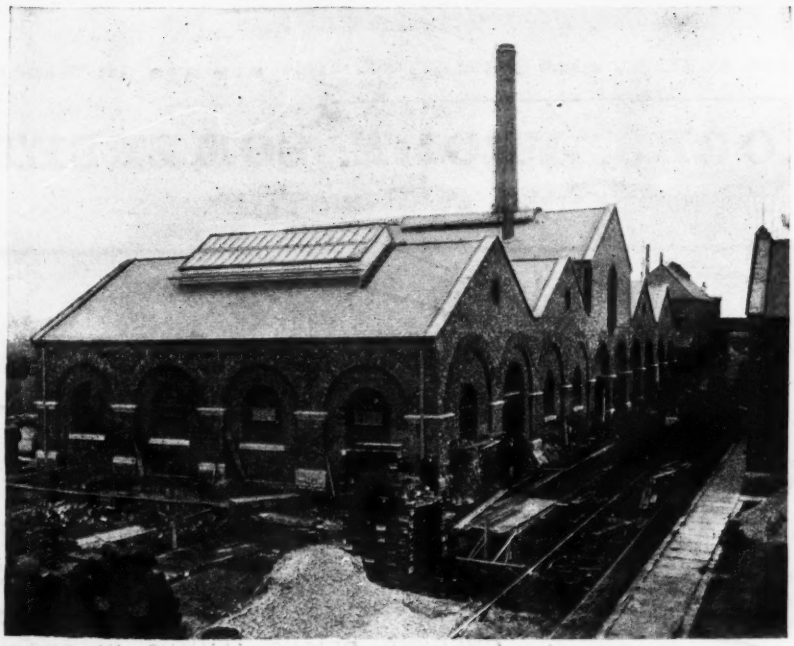

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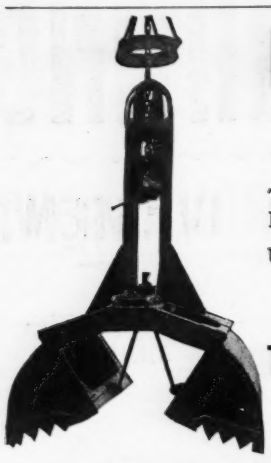

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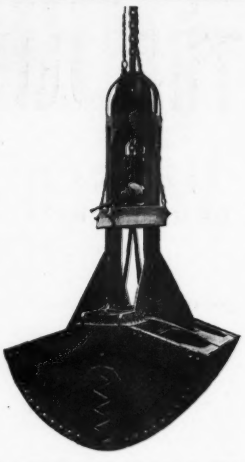

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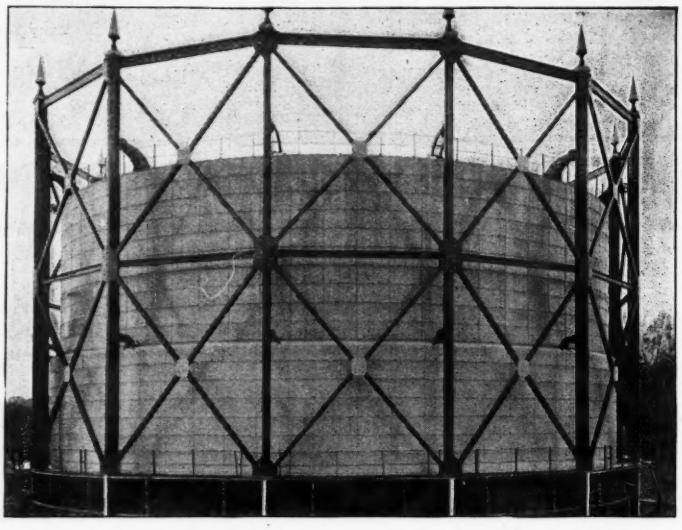

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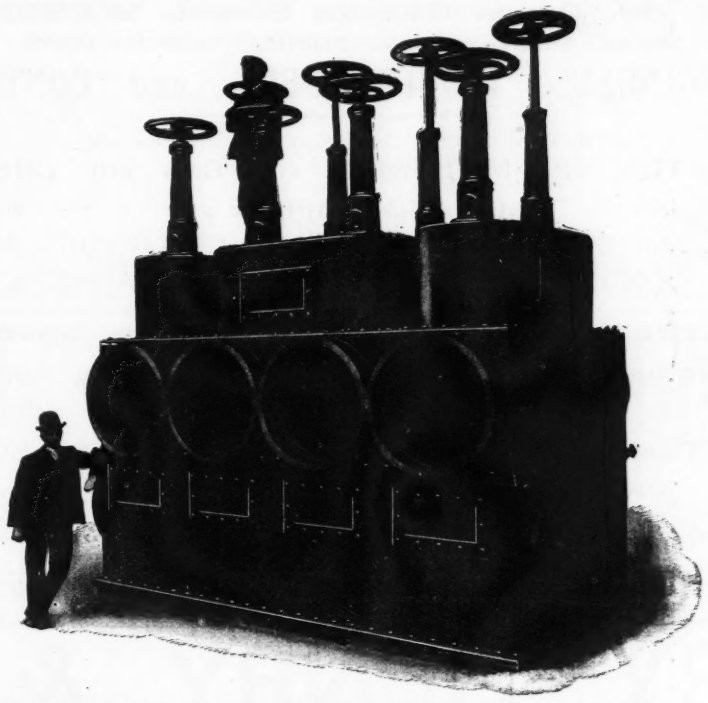

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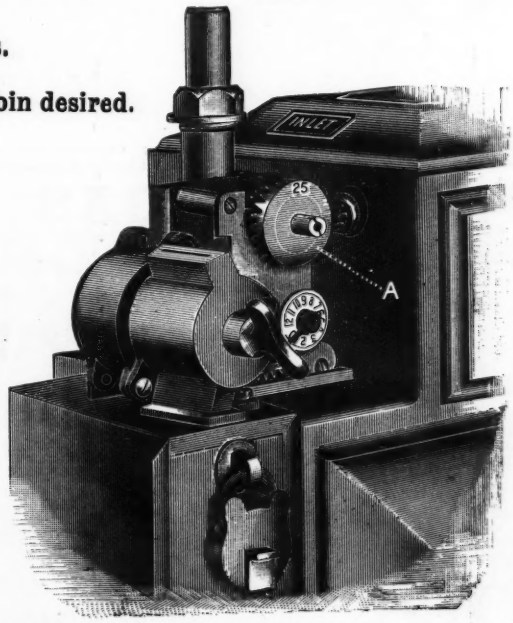

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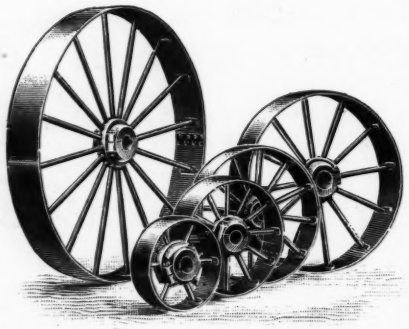

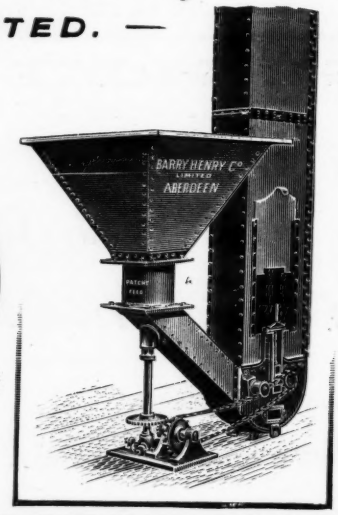

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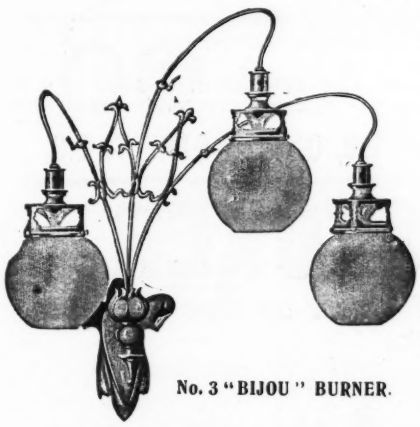

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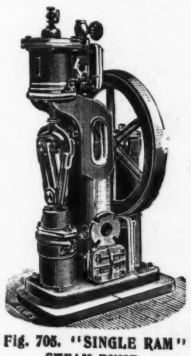

Fig. 708. "SINGLE RAM" STEAM-PUMP.

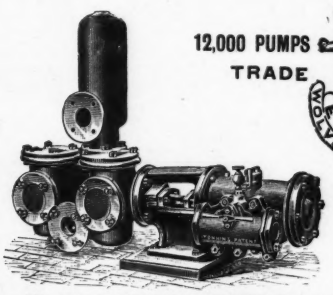

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

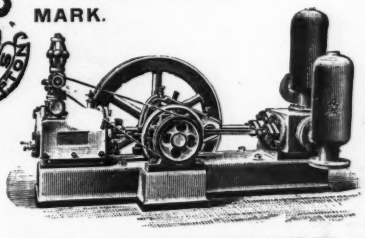

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

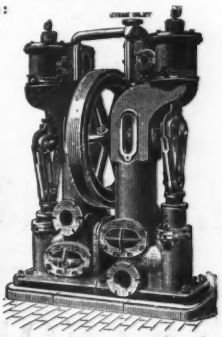

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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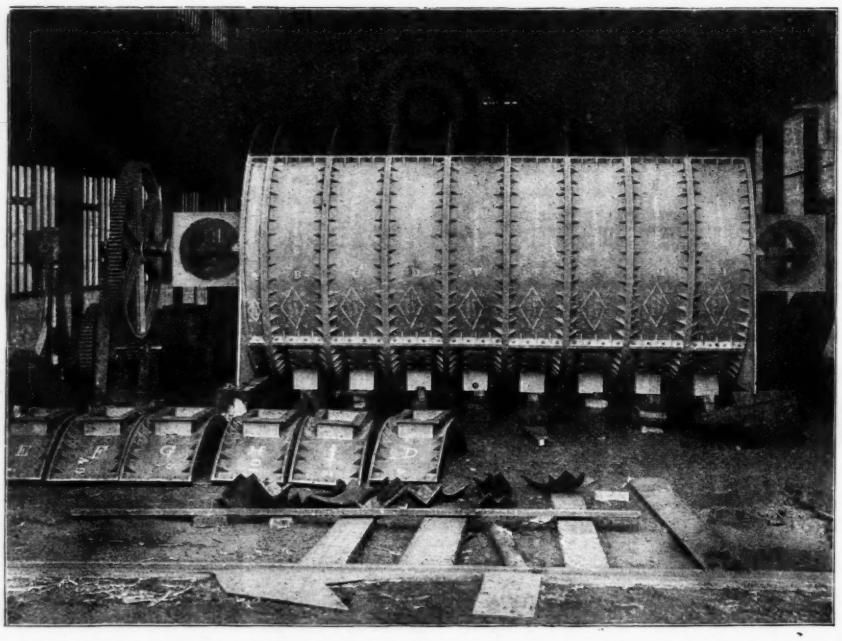

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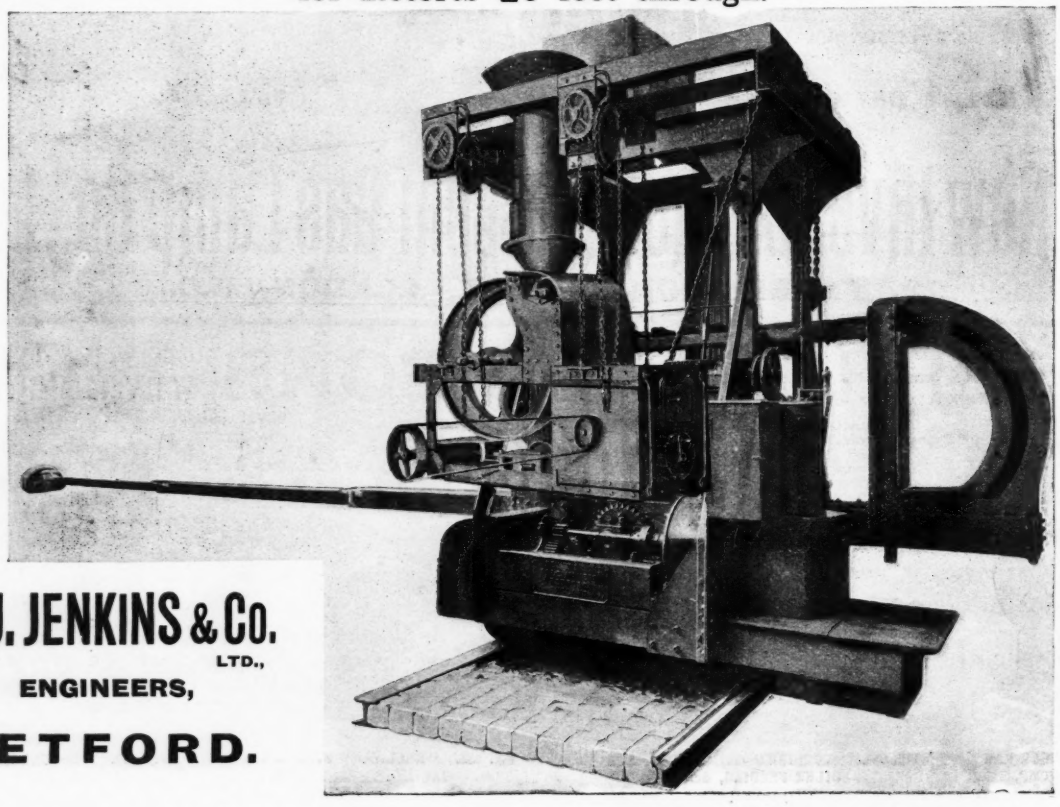

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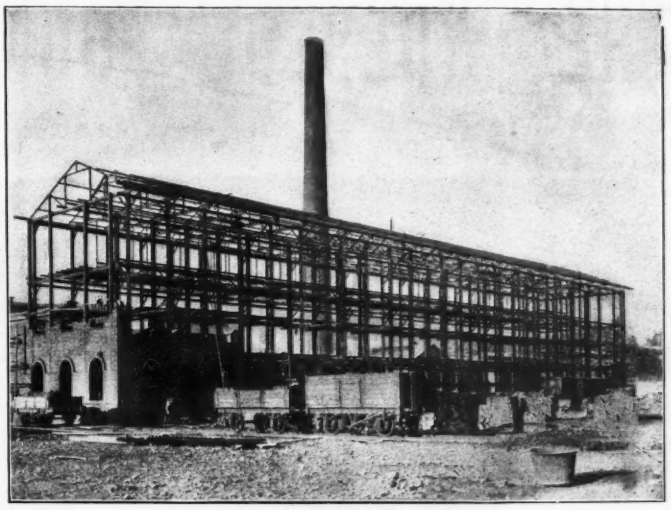

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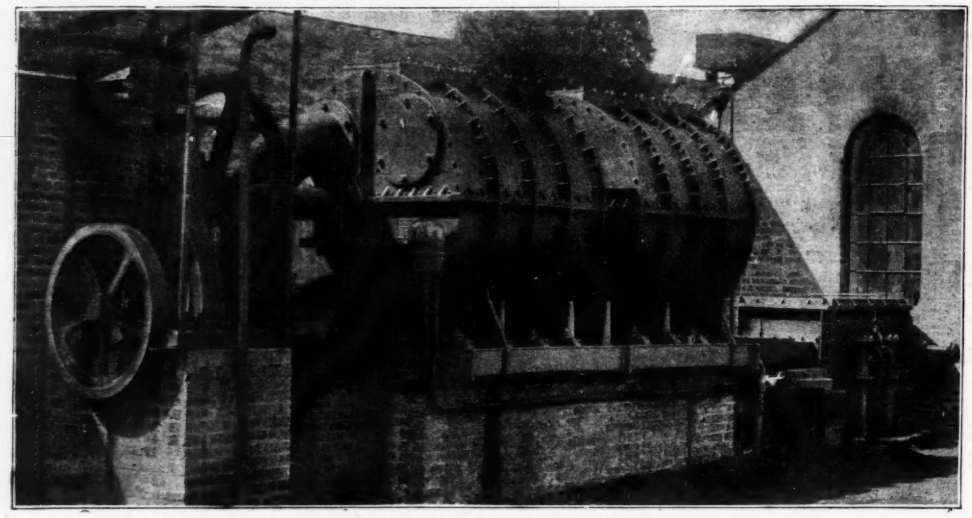

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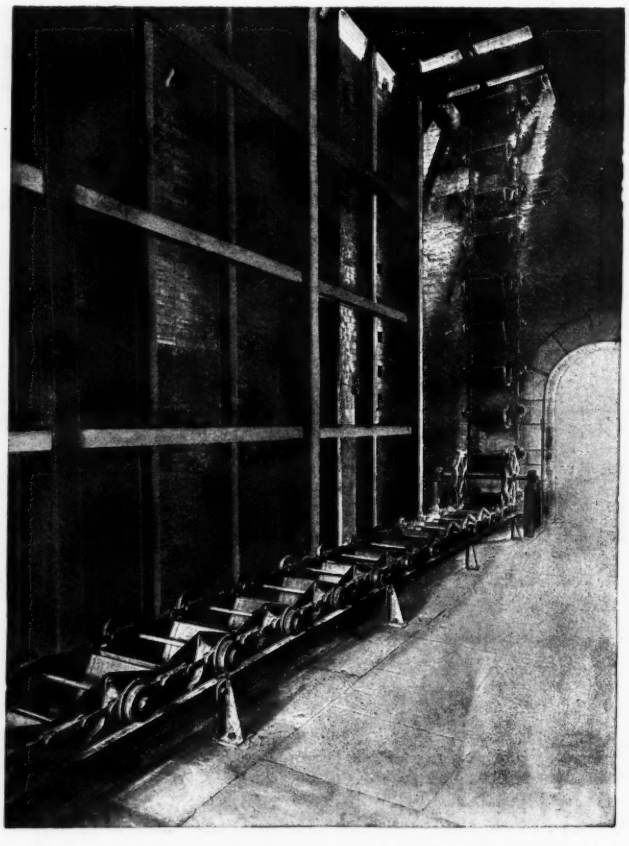

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Brussels—Forest	1,000,000	Lea Bridge	350,000	Southport (Second)	900,000
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Commercial (Second)	850,000	Magdeburg, Germany	1,400,000	Swansea (Second)	1,000,000
Commercial (Third)	1,250,000	Maidenhead	225,000	Sydney—Harbour	500,000
Commercial (Fourth)	2,000,000	Maidenhead (Second)	225,000	Sydney—Harbour (Second)	500,000
Copenhagen	700,000	Malta	400,000	Sydney—Mortlake	500,000
Copenhagen (Second)	2,500,000	Manchester	3,500,000	Sydney—Mortlake (Second)	500,000
Coventry	600,000	Manchester (Second)	3,500,000	Syracuse, N.Y.	850,000
Coventry (Second)	600,000	McKeesport, Pa.	500,000	Taunton	225,000
Croydon	1,250,000	Merthyr Tydfil	300,000	The Hague, Holland	1,000,000
Croydon (Second)	625,000	Middlesbrough	1,250,000	Tilburg, Holland	400,000
Croydon (Third)	625,000	Newburgh, N.Y.	350,000	Tottenham	750,000
Deventer, Holland	150,000	Newburgh (Second)	250,000	Tottenham (Second)	750,000
Deventer, Holland (Second)	200,000	New York	1,200,000	Tottenham (Third)	350,000
Dorking	150,000	New York	4,000,000	Tottenham (Fourth)	1,000,000
Dublin	2,000,000	North Middlesex	150,000	Tunbridge Wells	1,000,000
Dublin (Second)	2,000,000	North Middlesex (Second)	200,000	Utrecht, Holland	1,000,000
Dunedin, N.Z.	150,000	Norwich	1,000,000	Utrecht, Holland (Second)	1,000,000
Dunedin, N.Z. (Second)	275,000	Ostend, Belgium	100,000	Waltham	400,000
Durham	200,000	Perth, W.A.	125,000	Wandsworth & Putney	1,800,000
Eastbourne	1,250,000	Port Elizabeth, S.A.	400,000	Watford	300,000
Edinburgh	2,000,000	Portsmouth	1,000,000	Watford (Second)	350,000
Epsom	225,000	Posen, Germany	450,000	West Ham	1,500,000
Falmouth	150,000	Posen, Germany (Second)	700,000	Winchester	225,000
Faversham	200,000	Preston	1,400,000	Zwolle, Holland	200,000

AND WORK UNDERTAKEN SINCE JANUARY 1, 1904.

Taunton (2nd)	350,000	West Ham (2nd)	800,000	Alkmaar, Holland	400,000
Bognor	100,000	Brieg, Silesia	100,000	Leiden, Holland	500,000
Bournemouth (2nd)	500,000	Brussels—Ville (4th)	350,000	Poole	1,500,000
Vienna	3,500,000	Innsbruck, Austria	200,000	Berlin-Rixdorf	650,000
Maastricht, Holland	200,000	Marlborough	100,000	Berlin-Charlottenburg	2,500,000
Antwerp, Belgium (2nd)	1,000,000	Flensburg, Sleswig	300,000	Bochum, Westphalia	530,000
Tottenham (5th)	1,000,000	Weston-super-Mare	300,000	Brussels–Anderlecht	350,000
The Hague, Holland (2nd)	500,000	Wexford, Ireland	100,000	Leigh, Lancs.	350,000
Hampton Court.	500,000	Budapest, Hungary	50,000	Stockport (3rd)	400,000
Lea Bridge (3rd)	400,000	Swindon	300,000	Agram, Croatia.	200,000
Dublin (3rd).	650,000	Reading	1,000,000	Bruges, Belgium	200,000
North Middlesex (3rd)	75,000	Oberhausen, Germany	175,000	Liége, Belgium (2nd)	750,000
St. Gallen, Switz. (2nd)	225,000	Malmo, Sweden	350,000	Lemberg, Galicia	260,000
Brussels—St. Josse	1,000,000	Ipswich	750,000	Leeuwarden, Holland	400,000
Dundee	1,500,000	Winchester (2nd)	125,000	Stockholm	1,500,000
Bridgwater	200,000	Zwolle, Holland (2nd)	200,000	Romford (2nd)	350,000

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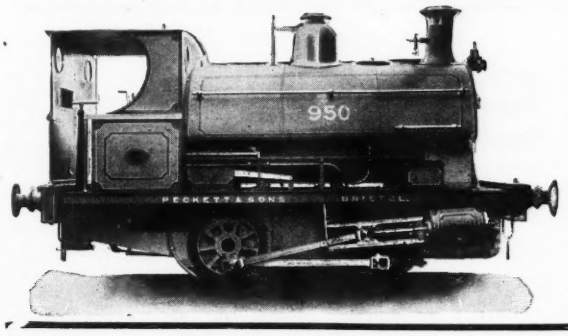

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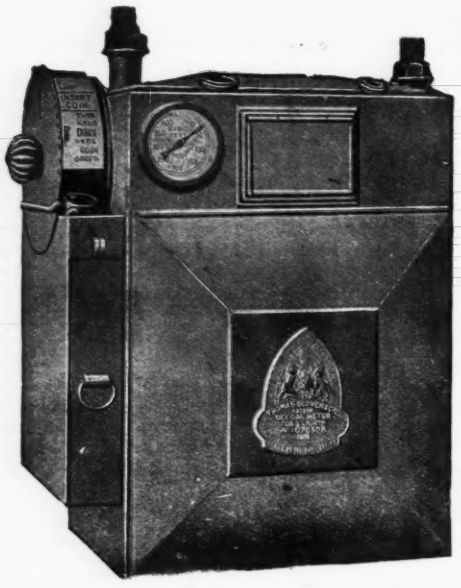

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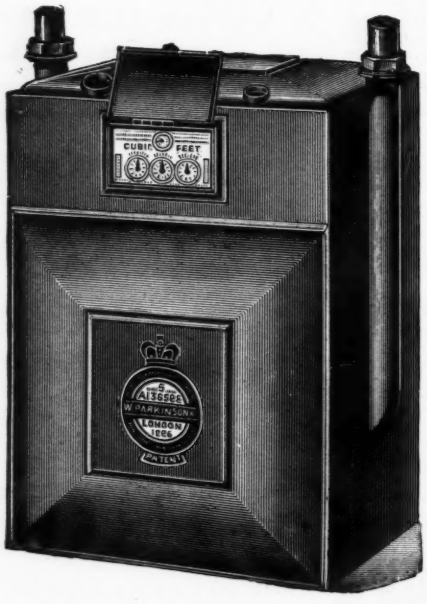

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VOL. XCIV., No. 2238.—TUESDAY, APRIL 3, 1906.

EDITORIAL NOTES—GAS, &c.

Opposition to the Sulphur Restrictions Bill.

IT must be as gall and wormwood to those who refuse to believe that Lord Rayleigh and other scientific men knew what they were talking about when they reported to the Board of Trade, for the information of Parliament, that the elimination of the sulphur compounds from gas is a needless refinement, and are pertinaciously persisting in opposition to the Joint Bill for the removal of the sulphur restrictions, to find that their small number is being seriously reduced. When the remnant, headed by the pragmatic London County Council, who have really no concern in the matter, appear before the Select Committee to whom the Bill will be referred for consideration, naturally one of the very first matters the Committee will want enlightenment upon is as to the reason the Authorities of Hull, Norwich, Hanley, Hastings, Reading, Richmond, Tunbridge Wells, and Wandsworth are not before them; and they will be told that these Authorities, like the governing bodies in the Derby, Tottenham and Edmonton, Chichester, and probably other Gas Companies' districts, are, after a complete consideration of the question, all satisfied that the Departmental Committee are right, and that had there been any real ground for the imposition of the restrictions in question, Parliament would long since have made their application general. Reading perhaps ought to be excepted from the list, as though a sufficient vote in the Council was obtained to negative their taking steps in opposition, the voting did not really represent a superiority in the number of members favourable to inactivity.

The authorities referred to above have not, it is only right to say, withdrawn opposition, as was suggested at a meeting of the Ipswich Council last week, without having had before them "reports, statistics, and tests." With those valuable aids to decision, the report of the Departmental Committee teemed; and—added to the 650 or so gas undertakings which are not under the sulphur clauses, and the consumers of which live and thrive equally with those whose gas is subjected to lime purification—the gas consumers of London and the suburbs can now add testimony as to their not having experienced any ill-effects from the abandonment of lime in purification. There is a great deal of vapid talk over this matter; and we do wish that the Town Councils and their officials would try to look at it in a practical manner. We cannot for example understand—and we conscientiously say this though consuming daily a large quantity of gas purified only by oxide of iron—what the Gas Inspector of Ipswich means when he says that, if anyone goes into a town where the sulphur restrictions are not in force, he will soon find out without being told. Perhaps he will show the direction of our ignorance, as experience has not pointed it out. The Ipswich Town Council have not yet decided whether or not to oppose the Joint Bill; but before they do resolve one way or the other, it may with respect be suggested to them that they consider thoroughly the figures that Mr. D. Ford Goddard put before them, and ask themselves what they mean, and what they establish. They may also be asked to consider the scientific position of those who signed the report of the Departmental Committee, and to put those eminent gentlemen into the scales with the Ipswich Clinical Society.

Returning to the withdrawal of opposition to the Bill, we regard as of no small importance the decisions of the local authorities of Hull and Norwich, and of the area supplied by the Potteries station of the British Gaslight Company, for the reason that these widely separated and important places are supplied by this one Company. Their stations expose the absurdity enveloping the limitation. The Company are supplying in five cities and towns; and while in Hull and Norwich the restriction has been to 30 grains and in the Staffordshire Potteries to 20 grains, at the Trowbridge and Holywell stations no restriction at all has ever been applied. And where no limitation has been applied, there has been no complaint, to the best of our recollection, regarding the purity of the gas; whereas at Norwich, well-founded complaints of nuisance caused by the effluvium on the change of purifiers have occasioned a great deal of trouble and anxiety. But a further peculiarity associated with the gas supply of Hull is that, while the Company have been hitherto working under the 30-grain restriction, the Sutton, Southcoats, and Drypool Gas Company, who supply gas in the eastern part of Hull, are under no sulphur compounds restrictions whatsoever. Although the Hull Corporation are themselves not gas makers, they are gas distributors—purchasing in bulk the supply they require for the Old Town from the British Gas Company. That again accentuates the importance of their decision. As their Gas and Water Engineer, they have a gentleman (Mr. F. J. Bancroft) who is able to appreciate the great difficulty imposed upon gas makers in their purification methods in gaining the little result which is the "bone" of all the contention, and who knows that, so far as the interests of the consumers are concerned, the removal of the sulphur compounds is altogether a work of supererogation. On his report, and on the evidence furnished by the supply of the two Companies in the one administrative area—the one Company under restriction and the other not—the Corporation have had no hesitation in coming to the decision that there is no real ground for opposition. This, and the announcement made on the subject by the Chairman of the British Gaslight Company (Mr. J. Horsley Palmer) at the meeting of the shareholders last Wednesday, will be very helpful to those other Companies who are being opposed by a diminishing number of authorities mistakenly hostile to a simple act of justice. For there is no reason why a handful of gas suppliers should be in a worse position than gas suppliers generally.

We therefore hope, before any further expense is incurred in opposition, that a spirit of "sweet reasonableness" will prevail, and that the remaining opposing local authorities will conclude that, weak as their case was when their petitions were first filed, it has undergone further decline by the withdrawals from their small force. Let them not be further guided by any wild flights of imagination, but by the everyday, practical experiences of hundreds of towns throughout the country.

Labour Questions in Parliament.

LAST week the time and attention of Parliament were greatly occupied by two matters of cardinal importance as affecting the relations between Capital and Labour. On Monday, Mr. Gladstone introduced the Bill of the Government for amending and consolidating the law as relating to workmen's compensation; on Wednesday it was the turn of the Attorney-General, who expounded the views of Ministers upon the necessity for revising the law in relation to Trade Unions and trade disputes; while on Friday an alternative Bill on the same subject was introduced by Mr. Hudson, on behalf of the Labour interest. It is scarcely necessary to say that all three measures aim at the improvement of labour conditions—an object with which everyone is in sympathy, so far as it can be effected without injustice to other classes of the community, or the creation of class privileges.

The Workmen's Compensation Bill has been received—and, so far as can be judged of its provisions, deservedly—with general approval. It aims at being a Consolidation Act, incorporating the Acts of 1897 and 1900, which is of itself a great improvement. There has been in the past too much legislation by reference, the assumption being that people are acquainted with the law; whereas this is a subject on which there is, generally speaking, much profound ignorance. Even lawyers are not exempt from it. As regards the extension of the liability of employers proposed by the Bill, it may be pointed out that the principle on which it proceeds was, in 1897—the date of the first Act—an entirely new departure, since it was then recognized for the first time that,

when a person on his own responsibility sets in motion an agency that creates risk for others, he ought to be similarly responsible for what he does. In this view the Act of 1897 was limited to the most dangerous employments, while compensation might be paid by the employer direct, or through insurance against risks. In 1900, these two principles were both abandoned by an extension to agricultural labourers and gardeners, which are among the safest employments in the country, while it exposed small farmers to the risk of having to pay heavy compensation in case of serious injury to a workman while unable to afford any insurance. The present Bill extends the Act of 1897 to every class of labour, for which purpose, instead of, as in that Act, excluding all classes of workmen not directly included, it comprises all classes who are not directly excluded. Moreover, certain industrial diseases are for the first time made subject to compensation—viz., anthrax, lead, mercury, phosphorus, and arsenic poisoning, and ankylostomiasis. There will be general agreement with the justice of this; although, as was pointed out in the course of the discussion, it may be somewhat difficult in some cases to attach liability in the right quarter. Some of the diseases are insidious and slow in their effects; and men may have changed their employment since contracting them. One of the main features of the Bill is the reduction of what has been termed the "close" time, from a fortnight to one week. This will increase the cost of compensation to employers, and possibly the risk of fraud; although, as a matter of principle, there seems no reason why payment should not be made from the date of the accident, after allowing sufficient time to elapse for proving the genuineness of the case.

Another important alteration relates to the treatment of old workmen. It is found that the Act of 1897 has had a deterrent effect upon the employment of aged persons; and the Bill proposes to enable the employer to make special arrangements with workmen over 60, under which, in case of death, a maximum payment of £25 would be payable, and, in case of injury and incapacity, a maximum compensation of 10s. per week. Reluctance to employ men who are advanced in years is based on the belief that such men are more liable to accidents than younger men. Sir George Livesey, however, in a letter sent recently to "The Times" (which was quoted in our issue last week), points out that, according to the statistics of the South Metropolitan Gas Company, this is not the case. It would be interesting to know what is the experience of Insurance Companies on this point. With regard to boys, it is proposed that, where a minor earning less than 20s. a week is injured, 100 per cent. shall be substituted for 50 per cent. in respect of compensation based on weekly earnings; but the weekly payment is not to exceed 10s. per week. There are other provisions of the Bill for facilitating the obtaining of compensation, and the avoidance of legal proceedings.

The measure, as a whole, may be described as one for advancing, by several steps, the principle of attaching to employers liability for accidents and diseases incurred by workmen during, and by reason of, their employment; but it shrinks from extending this liability to the small employer who may be little more than a workman, except in cases where machinery is used. It is hard to see on what principle this exemption proceeds, nor, also, why it is clerks and others should not equally with workmen be entitled to compensation for injury resulting from accident to machinery or plant. It is suggested that the solution to all the difficulties that exist in this connection is a system of compulsory insurance, through the medium of the Post Office. This is a development which has great possibilities, but for which the country is scarcely as yet prepared.

While a fairly smooth passage may be predicted for this Bill, the Trade Disputes Bill is likely to give rise to much discussion, and is certain to encounter some vigorous if futile opposition. It seeks to amend the law as laid down in the Taff Vale and other recent decisions, so as to abolish the law of conspiracy as it affects Trade Unions, and practically adopts the principle that what one man may lawfully do, may be lawfully done by any number of men acting in combination. This mischievous and subversive doctrine takes shape in the recognition of the right of "peaceful persuasion." Everybody knows that these two things mean in effect the taking from an employer his liberty of action. Any number of men may stand in close order at his factory gates, and obstruct the traffic with impunity, since they have only to plead that they are exercising their statutory right to "peacefully persuade." Meanwhile, the employer is helpless, although there may be many men outside the Union willing to work on his terms. In addition, the Trade Unions are not to be liable for any illegal act done by agents, unless it has been sanctioned by their representative governing body, as constituted by the Bill. Although this will appear to be more than enough, the Labour party at once made it clear that they wanted more. Mr. Shackleton pointed out that, under the provisions of the Bill, Trade Unions could do all kinds of objectionable things with impunity, since they only needed to repudiate them, in order to avoid responsibility. Mr. Hudson, when introducing his Bill on Friday, was still more candid. He and his friends wanted, he said, "entire immunity from the law," to give effect to which he proposed to enact that "an action shall not be "brought against a trade union, or other association aforesaid, for the recovery of damage sustained by any person "or persons by reason of the action of a member or members of such trade union or other association aforesaid." Here, in all its nakedness, is expressed the aspirations of the Trade Unionists, as largely represented in Parliament; but it would not be correct to say that there is yet unanimity among them on the point. On the contrary, the Attorney-General was in a position, in reply to Mr. Keir Hardie, to relate his experience to an opposite effect; and, when introducing the Bill of the Government, quoted some apposite remarks by prominent Trade Unionists on the subject. One —Mr. H. Bell—is reported to have said:

> "He failed to see how the Labour Members could meet their opponents in the House with the argument for being placed in a position different, and apart, from all others under the civil law." Having argued that all employers should be responsible for all accidents to workmen, no matter by whom or how caused, they were, on the other hand, asking that whatever act might be committed intentionally or deliberately under the rules of an organization by its executive government, they should not be responsible for any action thus committed. He thought that illogical. In the Taff Vale case, the rules were definite, and they were violated; and if the executive had adhered to the rules, there would have been no Taff Vale case.

It would be impossible to put the matter more fairly than this; and it is lamentable that the Prime Minister should, by speech and vote, have lent his countenance to a Bill which seems to be such a clear departure from the principles of justice and fair play, particularly after the appeal made by his Attorney-General the previous Wednesday. On this very question of immunity, Sir J. Lawson Walton said:

> In your wish to prevent injustice being inflicted upon trade unions, you may create injustice against individuals who are members of the community.

And again:

> You are proposing class privileges. . . . Do not let us create a privilege for the proletariat, and give a sort of benefit of clergy to trade unions analogous to the benefit of clergy which was formerly enjoyed, and which created an immunity as against certain sections of the population.

All this, however, and more, will follow if the Bills now before Parliament be carried into effect; and that there is considerable danger of this is apparent from the huge majority by which Mr. Hudson's Bill passed the second reading. Something may, however, be hoped for from the restraining influence of the moderate men of all parties, and, above all, from the judgment of the House of Lords.

Stand-by Supplies.

THE clause which the Mirfield Gas Company have in their Bill, giving them and their consumers protection in respect of the casual demands of manufacturers in trouble with their private gas-producing plants, grows in importance with consideration. The introduction of the clause in the Bill was due to Mr. Robert Porter, of Elland, who has been much impressed by the necessity of such a clause not only in connection with suction and other producer gas competition, but also in connection with stand-by gas plants to meet the emergency of an interruption of current, or a breakdown, where electrical motive power is usually employed. The text of the Mirfield clause was published in last week's issue (p. 871); and it is interesting to learn that the provision as to 24 hours' notice that was inserted when the clause was before the Lord Chairman had previously been the subject of discrepant views. As originally drafted, the stipulation as to 24 hours' notice was duly incorporated. Then it was removed, and, as we have seen, was ultimately restored at the instance of the Lord Chairman's Counsel. It was incidentally suggested last week that there was really no originality about the 24 hours' notice, seeing that the condition

appeared in the (now defunct) Ossett Gas Bill, as introduced. This is explained by the fact that the original terms of the Mirfield clause were (as we understand through the instrumentality of the Solicitor for the two Bills) incorporated in the Ossett measure at the time of drafting.

It is quite possible that the clause may be amended and improved as its construction is more widely considered. But its value as it stands must be at once conceded; for time has brought the experience that more protection is needed against the haphazard demands that arise from accident to private gas plants. When gasholders are low, and retort-settings have been let down to a point suitable for normal consumption, a large sudden demand from a manufacturer, even though 24 hours' notice be given, might perplex many a gas manager; and the danger increases with the multiplication of these private suction or other producer gas plants in a district. It is a common observation, and an all too-common experience, that troubles rarely come singly; and there is such a thing as accidents happening simultaneously. So that the risk of adventitious demands from manufacturing quarters is heightened by the increase in the number of private plants. But we would not advise that such a clause should be used with severity and as a scourge; only as a protection for those whose custom is regular. "A friend in "need is a friend indeed;" and succour in the hour of tribulation may be the means of regaining a friend and an excellent customer; for upon a manufacturer, to whom time means money, the proof of dependence and availability in the hour of pressing need must have an immense influence. To shut down works for even the term of the 24 hours' notice would be a serious thing for most manufacturers; but if they chose to cease their business relations with the local gas undertaking in response to the allurement of the suction-gas plant, of course they must accept the risk involved. However, a clause after the model supplied by the Mirfield Bill will be of great assistance in preserving the rights of a gas undertaking and its ordinary patrons on sudden demands being made by stranded manufacturers; and that is not a matter of small importance.

Settlements.

The duties of Consulting Engineers in connection with Gas Bills have not, as some people seem to imagine, as their chief purpose the putting in of as many days' attendance as possible before Parliamentary Committees; but it is part of their work to advise, and, if possible, to save by their advice their clients from an undue expenditure in parliamentary warfare; and, in any settlement that is come to, to see that their clients, in regard to technical and other matters, are fully protected. Their experience enables them to do this, and to safeguard their clients from many pitfalls. In recent sessions this duty has been exercised freely and conscientiously by gas practitioners; and this session again one by one the Bills are being removed from the scene of public contest. Consulting engineers who are able to effect, or endorse, a compromise acceptable to their clients, and which preserve their interests, are valuable economizers. They save time and expenses; and what is so saved represent, it may safely be said, several times the fees of the consultants concerned. Moreover, a settlement is always much to be preferred to a contest; for, after a contest, the relations of the parties are rarely, until the bruises of conflict are healed, of that happy nature that is desirable between two public bodies serving one community. Therefore, the more we can have of mutual understandings over these matters, the better.

In some cases, settlements are arrived at which to the onlooker appear to be altogether one-sided in character, and which are yet perfectly justified by inner circumstances. One of the latest settlements is that between the Rochester, Chatham, and Strood Gas Company and the Local Authorities, the terms of which settlement are set forth in "Notes "from Westminster." Here one or two of the conditions of the agreement which has cleared away all opposition seem to be of rather an onerous nature; but the advisers of the Company were not likely to be parties to the concessions without there were very excellent reasons why the Company should agree to them. Excellent, however, as the reasons may be, they are not obvious to the outsider. It is stated that the charge for gas used for power purposes is to be 2d. less than that used for lighting. If this means that the Company are not to allow rebates greater than 2d. for power, then this condition of the settlement is an invitation to the suction plant and producer gas people and the electric competitors to hurry in and get the industrial business as quickly as they please. If, on the other hand, the 2d. is to ensure that the manufacturer shall get a rebate, the provision is superfluous; for competition would ensure that he obtained a supply of gas for power purposes as cheaply as possible. There is another clause of the agreement that has an appearance of prospective oppressiveness about it. It is this: "After the period of five years, the price to be charged for "public lighting shall *not exceed the actual cost of the manufac-"ture of gas*, and that, if a dispute shall arise upon this point, "the matter shall be referred to arbitration." This seems on the surface to be a heavy price to pay for peace; and it is running close to the Continental practice of allowing the public treasury to benefit for the privilege of the supply concession. It is true that, as a general rule, the margin of profit on public lighting is a narrow one; but it does seem unreasonable to have the service rendered in producing, storing, and conveying the gas shorn of every particle of profit beyond the "actual cost of the manufacture."

The Wolstanton District Council Purchase Bill (the consideration of which was concluded by a Lords Committee on Monday of last week) raised an interesting question, which is discussed in "Notes from Westminster."

Lesson of the Ilfracombe Accident.

It is easy to be wise after the event; and no one who reads the report of the Coroner's investigation into the cause of the accident at the old works of the Ilfracombe Gas Company can very well miss the moral of it. The men immediately engaged in the removal of the holder seem to have been proceeding on an intelligible plan, and were not without experience. There was, however, no one to make them adhere to their scheme; and as their ideas were not shared by the foreman nominally in charge, there is little wonder that things were done which ought not to have been done, and that the ultimate result was disaster. Mr. James Armstrong, the new Manager, is to be sympathized with. He has hardly yet got his bearings in Ilfracombe, and no doubt found an abundance of work in connection with the ordinary run of his duties, without giving much thought to the dismantling of the old works. Similarly, the foreman seems to have had little time to devote to supervision of the job, and only attended to it when he could be spared from the more pressing demands of the new works, a couple of miles away. As the workmen were trusted and more or less skilful, there seemed no great harm in this; and probably no ill-result would have followed if everyone had done what he set out to do. The effect of the want of supervision was, however, a disregard of the precautions which ought to have been taken. The men who suggested a certain method of procedure were the first to depart from it. There was no real sense of responsibility. Each man, as the Coroner said, went digging and plucking away at his own particular spot, as though there was no one else on the job. The collapse of the holder under these circumstances was natural; and it is fortunate that more lives were not lost. Probably if one of the men—the deceased himself or another—had been vested with authority to supervise things, the result would have been different. It was clearly a case in which direct control of some kind was essential.

Dangers of Coal Storage.

Of the many anxieties incidental to the discharge of a gas manager's duties, not by any means the least are those which attend the provision and storage of his raw material. When, after possibly much negotiation, he has secured his supply of coal, it may meet with some accident before it reaches the works; and even when it has been deposited in the store it is liable to spontaneous combustion. As the last-named trouble lies, so to speak, at his very doors, he will probably read with interest the remarks made on this subject by Professor Lewes, in his third Cantor Lecture at the Society of Arts on "Fire, Fire Risks, and Fire Extinction," an abstract of which is given in another column. The lecturer pointed out that, though many coals which contain a high percentage of pyrites have never been known to seriously heat or ignite, a careful study of the phenomena occurring during the heating of a mass of coal leads to the conviction that the pyrites present can only play a very subsidiary part, and that it is really the absorption of oxygen by the freshly-won coal, and the activity of the condensed gas in contact with the hydrocarbons

n the coal, that are the chief factors in causing the ignition. How is this ignition to be prevented, and how is the coal to be treated after the fire has once made a start? These are the important questions for the gas manager; and we leave Professor Lewes to answer them in his own language. In this matter, as in many others in every-day life, the great thing is to check the evil in its initial stage; in the case of coal, to prevent such a rise in temperature as will be sufficient to start ignition. When fire has once broken out, the difficulty is to quench it; for, as the lecturer pointed out, though the first impulse would be to bring to bear upon it its natural enemy—water—in certain cases this would only, in homely phrase, be adding fuel to the flame. Professor Lewes, however, is not the man to be confronted with the dangers attending particular chemical actions and make no attempt to mitigate them. A perusal of the portion of our abstract of his lecture which deals with this question will show what he has done to secure the safe transit of coal; and though his proposal—made some fourteen years ago—has never been generally taken up, if its adoption has saved only one cargo, the firing of which might have been attended with loss of life as well as of the coal, he will have been rewarded for the time and attention he devoted to the solution of this most difficult problem.

The Midland Junior Association.

We feel that we cannot let the occasion pass without heartily endorsing the opinions expressed at Saturday's meeting of the Midland Junior Gas Engineering Association as to the notable success that has attended the first session's operations. It is only some nine months since, as the result of a circular sent out by Mr. Meiklejohn, of Rugby, to the members of the Midland Association, a meeting of gas-works assistants was held to consider the advisability of forming a Junior Gas Association for the Midlands; but already the proceedings of the organization that was the outcome of this conference are sufficient to "fill a book." Indeed, the only question is whether the pace has not perhaps been a little too fast. Mr. Berridge, of Leamington (who, with Mr. Meiklejohn, undertook the work of bringing the juniors together) expressed some doubt in this respect on Saturday; and then the suggestion was made that perhaps a meeting once a month during the winter, for a paper or a visit, would be found sufficient. The question was, however, left for the Council to decide when the Secretary has ascertained how many papers are likely to be available for next session. Of course, the record so far—an Inaugural Address, seven papers, and four visits—does not show any signs of dearth of interesting matter; but, then, if there were any possibility of a shortage in the future, it would be better to start husbanding the resources a little before it became apparent. There was, too, another aspect of these very frequent meetings to which Mr. Berridge called attention, and which might otherwise have been overlooked—that in the towns having only smal staffs at the gas-works, the engineer might find his own movements somewhat restricted by the oft-repeated absence of his assistant. However, on Saturday the members were principally concerned in considering the expiring session, and not the forthcoming ones; and on this head there was nothing but what was pleasant to be said. All those who have read Mr. Bywater's address and the various papers submitted will be inclined to agree with Mr. Berridge that they were of such a character as would not have disgraced any of the Senior Associations. The comparative smallness of the number of members who have taken part in the discussions was referred to; but there already appear to be signs of an improvement in this respect. Mr. Leslie Wilson's paper on "Retort-House Governors," read on Saturday, gave rise to a well sustained and interesting debate, in which a fair number of speakers took part. The paper which the new President, Mr. G. W. G. Tatam, read last December, entitled "Some Physical Aspects of Gas Manufacture," will lead the members to expect something good from him in the way of an Inaugural Address at the opening meeting of next session. Mr. Bywater has thoroughly earned, by his conduct in the chair, the hearty vote of thanks which was accorded to him on Saturday, and also Mr. James Hewett for the manner in which he has carried out the by no means light secretarial work of an Association with a membership of well over a hundred. To be exact, the members number 110; and the average attendance at the meetings has been 55—which is, considering all things, a very good proportion.

NOTES FROM WESTMINSTER.

For one day only last week were gas topics heard of in a Committee Room of the Houses excepting in the Court of Referees (where Lord Robert Cecil is now doing some very useful work as a member) and before the Unopposed Bills Committee. The Wolstanton District Council's Gas Bill provided the one day's exception; and the issue which has been raised upon it, and which will in all probability be further contested, is an interesting one, as the notes below and the conclusion of the report elsewhere disclose. The terms of the Rochester settlement are now published; and references also appear below to certain of the Local Authority Bills. Before the Unopposed Bills Committee, the principal discussion of the week arose on the Cardiff Gas Bill. As our "Parliamentary Intelligence" shows, the Court of Referees have granted the Cork Gas Company *locus* in respect of the proposed operations of the Cork City Railway. It is necessary for Gas and Water Companies to keep a sharp look-out in these days of rapid railway extensions. Cork is not the only Gas Company this session who are in occupation, or are owners, of land on which the eyes of the projectors of new, or extensions of, railways have cast their eyes with a desire to possess.

The Interpretation of an Old Clause.

The Bill of the Urban District Council of Wolstanton, which was discussed up and down with considerable minuteness for two days before Earl Cawdor's Committee, raised the very interesting question as to what was the intention of the Legislature when, in 1877, they gave to any authority, within the area of gas supply of the Burslem and Newcastle-under-Lyme Corporations, the right to purchase (without a time restriction) such part of the "mains, pipes, and other works" as are used for the supply of gas within the purchasing authority's area. *Primâ facie*, the intention of the Legislature in 1877 appears to have been a perfectly simple one; but the lapse of nearly thirty years since the clauses were framed and passed enabled what seems to be a great deal of extraneous matter to be imported into the consideration of the question before the Lords Committee at the beginning of last week and the end of the preceding one. The whole opposition of Burslem and Newcastle-under-Lyme rested on the one question. The power of purchase conceded to any authority within the areas of supply of the Corporations being hard and fast in their Acts of 1877, their Lordships of the 1906 Committee were relieved entirely of any necessity to consider such questions as whether the gas consumers in the urban district of Wolstanton would be benefited or injured by the taking up of the powers by the Authority of their own making. The urban district of Wolstanton was only formed in April, 1904; and the area includes Wolstanton, Silverdale, and Chesterton. The Chesterton Gas-Works the new Authority are purchasing at an agreed price; and —the Burslem and Newcastle-under-Lyme Corporations supplying in other parts of the district—they are proposing to exercise the powers conferred in the 1877 Acts of those bodies. There was a great deal of argument as to what it is the Wolstanton people have got to buy from Burslem and Newcastle-under-Lyme; and as to whether, if "mains, pipes, and works" constitute the whole, any rights and privileges remain to the Corporations after the purchase. For a proper solution of the question, it is necessary to attempt to translate oneself to the year 1877, and take the position at that time. The Corporations were then purchasing certain Gas Companies' undertakings; and Parliament said to them: "You may purchase these undertakings, subject to the authorities outside your own administrative area being allowed to purchase from you the 'mains, pipes, and other works' which are situated in their areas." With that condition the Corporations or their predecessors were evidently well satisfied in 1877, seeing that they went forward with the purchase of the gas undertakings. What the Corporations had to buy in connection with the gas supply in Wolstanton and Silverdale in 1877 could not have borne any considerable relation to the whole of the price they were called upon to pay; and no doubt, in fixing the price then paid, consideration was had to the fact that, in their extra-territorial districts, all that Parliament had said they would have for sale were the "mains, pipes, and other works" which might exist at the time any outside authority desired to purchase. As the matter is looked at to-day, Parliament may have been unfair in imposing the condition. But the condition has remained unaltered —it was part of a bargain; and the only thing now is as to the legal construction that can be put upon it. The buyers and the sellers look at it in different ways; as naturally do their legal representatives. It is entirely a question of interpretation. The Wolstanton promoters, as the prospective purchasers, say that Parliament intended what the words literally convey—that the sellers are to sell to them the "mains, pipes, and other works" in the district, and, until such time as they are called upon to sell, they may continue to enjoy the privilege of doing business in the districts. The Corporations, on the other hand, argue that the meaning of the words is that, what they are to sell, and what the purchasers are to buy, is an integrant part of their undertakings; or otherwise, if they sell the mains, pipes, and other works only, that then the rights and privileges they purchased under the Acts of 1877 are to continue, and therefore that they can lay new mains, pipes, &c., and compete for business with the purchasing authority. We cannot help thinking—and it is only reasonable so to think—that, when Parliament gave to the authorities outside the administrative

bounds of Burslem and Newcastle-under-Lyme the right to purchase the mains, pipes, and other works in their districts, they intended that the rights and privileges of supply in those districts should be completely vested in the purchasing authority, and that the rights and privileges of Burslem and Newcastle-under-Lyme should then be determined; for all the rights and privileges granted in 1877 were distinctly stated to be subject to the provisions now in dispute. That competition was not contemplated in 1877 seems to be as clear as possible. In the Burslem Gas Act, it explicitly says "that nothing in this section shall prejudice any application by any sanitary authority formed, or to be formed, . . . for parliamentary powers to supply the said township . . . with gas." That certainly does not establish any privilege of competition. Then again, in the Newcastle-under-Lyme Act, it states that all "the mains, pipes, and other gas-works of the Corporation within the district of such authority (*except* such mains, pipes and works, if any, as are used for service beyond that district) at such a price," &c. The positive exception appears to us to be highly important, as expressly protecting and continuing the rights of the Corporation beyond the purchasing district on the cessation of their supply within the district. The statutory rights, it is feasible therefore to think, were only to have existence until the new purchasing authority were in a position to take up the rights that Parliament—correctly or incorrectly in 1877—considered that it was proper to confer on them. If, too, competition was contemplated in 1877, then it seems only rational to suppose that Parliament, instead of wording these clauses as they did, would, instead of giving the new authority the right to purchase the mains, pipes, and other works of the established concern, have allowed them to put down a new distribution system of their own. The purchase of the mains and pipes, it is only natural to say, carries with it the undisputed right to the business done and to be done through those pipes; otherwise, if there was to be competition, Parliament would certainly have preserved the custom to the possessors of that custom. We cannot, however, blame Burslem and Newcastle-under-Lyme for trying to get all they can out of a position created in 1877 that is somewhat hard for them in 1906; and, on the other hand, we cannot blame Wolstanton for obtaining the full advantage that it seems clear Parliament in 1877 intended they should have, and which advantage Burslem and Newcastle-under-Lyme had before them when they purchased the Gas Companies' undertakings some thirty years ago. The House of Lords have, in effect, endorsed the Wolstanton reading of the sections in question; but as the Corporations concerned did not appear on clauses before their Lordships, it may be taken that they are going to carry their grievance to the House of Commons. Mr. Corbet Woodall and Mr. E. H. Stevenson were called in support of the promoters' case. Mr. Henry Peaty, the Manager of the Burslem Corporation Gas-Works, was one of the witnesses who appeared for Burslem; and Mr. W. A. Valon gave evidence on behalf of both Corporations.

The Rochester Settlement. As was anticipated, Mr. Tennant's Committee have been relieved of the duty of considering the Rochester, Chatham, Strood, &c., Gas Company's Bill—a settlement having been arrived at between the promoters and the Corporations. The terms include a clause that the gas shall be tested as in London under conditions laid down by the Gas Referees. A clause is to be inserted providing for a station for testing the gas at least 1000 yards from the works. With respect to sulphuretted hydrogen, the provisions of the Gas-Works Clauses Act, 1871, are to apply. The standard price is to be fixed at 2s. 11d.; but no increase in standard dividends is to be made until the price charged for gas is below 2s. 9d. The name of the Company is to be altered to Rochester, Chatham, and Gillingham Gas Company. The charge for power is to be 2d. less than the charge for lighting. In clause 27 a proviso is to be inserted that, where the mains are laid in private streets, they are to be placed in such situation, and at such a depth, as the Corporations may approve. The Solicitors of the Company are to give an undertaking that the Directors will, on the Royal Assent being given to the Act, enter into agreements with the three Corporations that for the next five years the charge for public lighting shall remain at the rate now charged; that so far as Gillingham is concerned, they shall not be charged the extra percentage which has lately been put on; that after the said period of five years the price to be charged for public lighting shall not exceed the actual cost of the manufacture of gas; and that, if a dispute shall arise upon this point, the matter shall be referred to arbitration. The Company are also to pay the costs of the Corporations in connection with their opposition.

Undischarged Accounts for Gas. When contested Bills come before Select Committees, the points upon which there is opposition, and any influencing questions, are as a rule the only ones that are thrashed out; when Bills are not the subject of contest, then before the Unopposed Bills Committee, their details are subjected to official dissection, and any departures from the Model clauses are closely examined. Readers who desire illustration cannot do better than peruse the report in our "Parliamentary Intelligence" to-day of the proceedings upon the Cardiff Gas Bill. Among the changes introduced by the clauses of the Bill is one which will empower the Company to refuse a supply to a person not only on a change of tenancy when he has not discharged his account for gas supplied to the premises he has quitted, but also to refuse a supply of gas to any premises simultaneously occupied by a consumer who has not paid his account for gas at any one of them. This extension of the power is useful.

Accrington Gas and Water Board Bill. It has already been stated that the opposition to the Bill of the Accrington Gas and Water Board has been withdrawn, and that, so far as can be seen, the measure will now go forward without further hindrance. The opposition had reference to the new water powers; and, before coming to Parliament, there had been certain overtures concerning the land involved. The owners were Messrs. Hallam; and the former offer of the Board has now, on the Bill getting to the point of contest, been accepted. The only difference is that the rental that was previously offered has now been converted into a capital cash payment. The Board have gained the sole right of pumping water within a mile of their well, together with all the necessary easements required in connection with their operations. The settlement has saved not only a parliamentary contest, but subsequent arbitration; so that the Board and their constituents have something for which to be thankful.

An Expensive Dam. In connection with water-works engineering, the unknown is an important factor in the ultimate cost. However great the care may be in the preliminary surveys and the making of the estimates, something unforeseen often happens that the most liberal allowance for contingencies will not cover. Bacup has a case in point. The Corporation have a Bill in Parliament this session; and it came before the Police and Sanitary Committee last Tuesday and Wednesday. It deals with the new water-works in the Cawpe Valley; the Corporation asking for power to borrow an additional £75,000, and for an extension of time in which to complete the works. A fault in the strata, which was only discovered when making the trench for the dam across the valley, is the cause of both requirements; the foundation having to be carried down three or four times the designed depth. Posterity in this case will come in for an unearned benefit; for Mr. James Diggle states that, if the dam will last a day, it will now last 2000 years. The Police and Sanitary Committee, however, could not, and they were not asked to, spread the loan over anything like this period; and so they ordered that £50,000 of the additional money required should be repaid in 60 years and the remaining £25,000, which is for filters, mains, &c., in 45 years. The extension of time was also allowed.

Expert Advice. In last week's survey of parliamentary work, mention was made of the withdrawal of the Fulwood Water Bill when before Committee. The opposition proved that the Council were distributing the excessive quantity of 40 gallons of water per head per day; and therefore, before entering upon an expenditure for new works, it was contended they ought to take steps to save the unreasonable waste. The subject of the withdrawal of the measure was before the District Council last Thursday; and these "Notes" provide a suitable place for reproducing the following brief but pithy conversation which is reported to have taken place:

Mr. JONES: Did our expert witnesses know we were consuming 40 gallons per head before the Bill was presented to the Committee?

The CLERK (Mr. Brierly): Oh, yes.

Mr. JONES: Did they say it was excessive, and that we should have no possible chance with the Bill?

The CLERK: No.

It is sometimes a pleasure for one to know that comment is not obligatory.

The Ohio Question-Box for 1905-6.

From the Editor of the "Question-Box" of the Ohio Gaslight Association (Mr. Henry L. Doherty), has been received a copy of the volume presented at the twenty-second annual convention of the Association on March 21 to 23. The first words must be of regret that the able and stalwart Editor has announced his intention of severing his connection with the work on the completion of the present publication. We are sorry that Mr. Doherty finds it necessary to do this, because, in establishing the question-box, he has had to fight against long odds, he has lived down criticism, converted adverse critics into friends and assistants, and has been ever ready to listen to, and to weigh well, all the advice that came to him that bore the impress of being tendered with the sincerity that speaks of interest and desire for the highest welfare of this form of technical harvesting. And not only this, but in the work of organization and in the accompanying and inseparable outlay, Mr. Doherty has borne, though he has not spoken to us of it nor is it mentioned in the preface to the volume, an unduly large part of both. But he has been interested in the work, and is well satisfied with the result. In spite of the facts that the mailing list has been materially reduced, and that no strenuous efforts have been made to arouse inactive fraternity members or to cultivate new ones, there are 571 questions to which 3620 answers have been contributed by 458 men. Mr. Doherty very heartily appreciates the spirit of co-operation which induced some dozen or so correspondents in Great Britain to contribute valuable data and answers. We can only hope, now that Mr. Doherty is severing his connection, the work will not suffer.

AN AMERICAN INVESTIGATION INTO COMPANY AND MUNICIPAL MANAGEMENT.

No one country can boast perfection in its administrative systems—public, private, commercial, or manufacturing—and therefore there are many things that we can, for example, learn of America, and America of us. The subject of this article gives to this country one special lesson from our American friends that may be read, marked, learned, and inwardly digested, with, it is to be hoped, beneficial effect. It is the lesson of how by a voluntary expenditure of time and privately subscribed money, collective effort can do solid work in enlightening the public mind on some matter of common importance, and thus advance the national interests. The body politic are too prone to listen to the claptrap of interested tongues, and from this failing, and the want of knowledge and discrimination, much mischief has issued. We have in our midst to-day a Commission sent over from America for the specific purpose of inquiring into, and reporting upon, in a manner understandable by all who read, public and private ownership and operation of such undertakings as gas, water, electricity, and tramways. The Commission have no particular bent towards one or the other form of administration. Their object is to ascertain the truth and the facts; but to draw no deductions, to express no opinions, and to offer no recommendations. After, however, completing the collection, they will sort out the facts, make an orderly arrangement, and present the whole in intelligible shape.

What has brought about this Commission of Inquiry? Dr. Milo R. Maltbie, who, with Mr. J. W. Sullivan, is responsible for organizing the work in this country, tells us that, on the question of municipal trading in America, there has been a good deal of heat exhibited, and a great deal of contradictory statement published, but very little dependable fact has been forthcoming. Therefore it has been concluded that the time has arrived when there should be more light thrown on the question by the ingathering of the experiences of other countries. To this end, the Commission now working in this country will make an unprejudiced investigation into as many works as they are privileged to inspect, and as time permits them to undertake thoroughly, and then they hope to proceed to the Continent. Three months are to be devoted to the work in this country; and already the Commissioners have been here about a month. The central body who have sent over this Commission is the National Civic Federation; and its principal line of activity is the investigation of the public ownership problem. For this purpose a Commission on Public Ownership and Operation, composed of a hundred prominent men representing various views and many interests, has been selected by the Federation to investigate its various phases in America and abroad. Each system coming under inquiry is being examined with regard to its effect upon, among other topics: Manufacturing and financial results and methods of operation; wages, hours, and conditions of labour; collective bargaining; cost and character of service; political conditions, civil service, spoils system, and municipal corruption; and taxation—with a study of the results of the service from the points of view of municipalities, companies, consumers, and citizens generally. It is to be, as we have already made clear, a purely scientific inquiry; the result being a collection of authoritative data. Investigations are proceeding in America concurrently with the work of the Sub-Committee in this country. The services of the Committee are gratuitous—their expenses only being defrayed by the Federation.

The lists of Officers, Investigation Committee, and the General Commission contain the names of prominent men engaged in the many great and varied interests of America—public and private—incorporating, too, all and every shade of political and commercial opinion, and representation of professional life. In the long list of names constituting the Committee on Investigation are those of men quite well known to "JOURNAL" readers. There are Mr. Walton Clark, one of the Vice-Presidents of the United Gas Improvement Company; and Mr. E. W. Bemis, Superintendent of the Cleveland Water-Works. The names of Mr. J. W. Sullivan and Dr. Maltbie (already mentioned) appear in the same group. In the list forming the General Commission are observed the names of Mr. Walter S. Allen, ex-Secretary of the Massachusetts Board of Gas and Electric Light Commissioners, Mr. F. E. Barker, Chairman of the Board, Mr. Bemis, Mr. Walton Clark, and Dr. A. C. Humphreys, President of Stevens Institute.

There are a few other interesting features about the work that is being carried on in this country. In connection with the management and operation of gas undertakings, arrangements have been made for the assistance of Mr. William Newbigging in relation to the engineering side of the question; and in the financial department, the services of Mr. Robert C. James, the Supervising Accountant of the United Gas Improvement Company, have been secured, together with those of Mr. Turner, of Astbury, Turner, and Co., Chartered Accountants, of Manchester. Mr. J. B. Klumpp, the Engineer to the United Gas Improvement Company, will also render service in connection with gas-engineering matters. A large part of the time so far has been spent in preliminary work and organization; and hereafter it is intended to simultaneously conduct inquiry into all the services of a town—such as gas, water, electricity, and tramways; many representative company and corporation concerns in each department being investigated. Up to the present, inquiry has been largely confined to gas-works; and in every direction the Commissioners are proceeding in a thorough and conscientious manner. The Leicester gas undertaking was the scene of the opening of the inquiry; and from there the Commission went to Sheffield, where their labours were nearing completion last week. From Sheffield, it is probable that work will be opened up in Manchester, thence the investigators will proceed to Glasgow. Further engagements (it is hoped to include the South Metropolitan and Newcastle Gas Companies) are now being made. Dr. Maltbie speaks enthusiastically of the courteous receptions the Commission are receiving wherever they go, and of the facilities and assistance that are being offered on all hands to secure the desired information. From other places, too, for which arrangements have been made for a visit, there have been assurances of every opportunity being given to examine completely the plant, the methods, and the results of operation. Nothing favourable or unfavourable will be said in the report; but the plain unvarnished facts will be set forth.

The work which the Commission have in hand is worthy of approval and support. In America, the conditions and supervision of public services have, according to Dr. Maltbie, been of rather a chaotic and unscientific character. Each State has its own system; and development has been somewhat hap-hazard. If only, by example, the gas undertakings of this country can supply anything that will be of service to our cousins across the Atlantic, we are confident that it will be freely rendered. We wish the investigators the fullest measure of success in their mission.

THE CONSERVATION OF COAL OR THE EXTINCTION OF A NATION.

SOME such antithesis as the above is apparently that which Mr. A. J. Martin is desirous of suggesting by the paper he read before the Society of Arts on Wednesday last, and the essential portions of which are given in another part of our present issue. He chose a triple subject: "Coal Conservation, Power Transmission, and Smoke Prevention." On the first topic, his remarks were based on the recent report of the Royal Commission on Coal Supplies, from which, however, he made an important deviation; the second division of his subject-matter formed an elaborate, if fallacious and unconvincing, argument in favour of high-pressure distribution of coal gas, manufactured at the pit's mouth; while the last subject of smoke prevention was hardly mentioned at all. The connecting thought seems to be this: Let us conserve our coal by making it into gas at the collieries, and distribute it thence throughout the length and breadth of the land, for light, heat, and power, and so stop the smoke nuisance.

The first requirement in a paper of this kind is to shock the audience by drawing dreadful pictures of what will happen in the near future if certain changes in the present state of things are not made at once. The affraying argument runs thus: Coal is "the foundation of our national greatness;" how long will it last? "Just over a century; to be exact, to the autumn of 2012." If no coal, then no nation; still worse than this, no food. It is to be regretted that the author does not carry his direful dirge a step further, and tell us what happens next. But he stops short there, with Sir William Crookes's British Association address of 1898, and leaves us with the cold consolation that then "our only chance of averting starvation lies through the laboratory." We fancy that some of us might prefer the former to the latter. But, seriously speaking (if such propositions are entitled at all to serious consideration), what practical good can come of such alarmist theorizing and vain imagining, based as they are on fallacies that are as old and as dead as Malthus? They start from supposition, and assume that future conditions and requirements will be the same as exist at present. Such methods are particularly exemplified in Mr. Martin's paper. The Royal Commission on Coal said: "It is highly improbable that the present rate of increase of the output of coal can long continue;" yet our author calmly goes on the assumption that it will, and makes his calculations accordingly. This is the deviation to which we referred above. He is good enough to assure us that our stock of coal "will not be exhausted within any such period" as he has named; but, if so, what can be the point of his futile calculation? "But what is practically certain," he goes on, "is that at no very distant date a cheap and abundant supply of coal, such as we enjoy to-day, will have become a thing of the past." Here again is a mere *dictum* based on no evidence of facts, but pure prophecy and imagination. The very reverse is quite as likely to be true.

Failing facts and prophecy, Mr. Martin adopts a moral attitude, and asks us, in legal metaphor, to look at the matter from its ethical side. We know that coal has many black sides to its character, but we have never yet considered it as a moral object-lesson. In neither a legal nor a moral, and not even a common, sense, can we be said to be either "tenants for life" or "trustees" of our coal supplies. This would not be true even if we had collective ownership or nationalization of our mines. It is certainly far from the truth, when there is absolute ownership by the individual, who holds his property for himself and himself alone, both in law and in right. Mr. Martin cannot be regarded as being very

complimentary to his fellow-countrymen when he considers that their "very existence as a nation" depends, not on themselves, but on their coal supplies. As if, indeed, England was not a nation long before the hewing of coal, and as if, forsooth, the British Empire would crumble away for want of a ton of coal. No wonder, then, that the author can only explain the backwardness of industrial England to change its antiquated methods, and its hesitation to enjoy his smokeless paradise, by "that almost 'passionate dislike of innovation' which is so characteristic of the English and of the Chinese." The foundation of England is not coal, but character; its conservatism is one of the strongest guarantees of its sane progress and secured endurance.

The gas industry itself is a good illustration of this sane progress. Mr. Martin very properly notes "the slow growth of a great industry from small beginnings under changing conditions;" and it is precisely because of this growth and its adaptability to these conditions that the gas industry stands in the high position it does. Instances of this can be seen all round—in finance, by the adoption of the sliding-scale; in labour, by machinery; in consumption, by reduced illuminating power; and geographically, by locating new works outside towns. It is in this last-named item that the author would have gas engineers go much farther—to the South Yorkshire coalfields, 173 miles from London. We will briefly summarize his argument, and leave his figures in detail to the tender mercies of our readers. Coal delivered at the retort-mouth in a London works costs 13s. 4d. per ton. Half of this sum, 6s. 8d., represents the value of the coal at the pit's mouth; the other half being the cost of transport and handling, and equivalent to 8d. per 1000 cubic feet of gas. What would it cost to transmit gas instead of coal to the Metropolis, reckoning an annual consumption of 180,000 million cubic feet? Mr. Martin's answer is 1·43d. per 1000 cubic feet; hence a saving of 82 per cent. in favour of gas transmission. His capital expenditure would be £8,032,000 on piping plant, and £2,500,000 on compressing plant. The annual expenditure would be £788,200 for transmission and £290,000 for compression. Nothing is included for fuel in the latter figure, "steam being raised with the waste heat from the retort-settings."

Having, to his own satisfaction, transmitted the gas, the author next deals with a "provisional estimate" of its cost of manufacture, though he adds that "this question is far too intricate to be definitely dealt with by an estimate." So he takes the cost at half-a-dozen places (among which are the important towns of Colne and Stourbridge, besides a chemical works); and he thus arrives at a net manufacturing cost of 1·78d. per 1000 cubic feet, which, with additions, becomes an ultimate selling price of 1s. per 1000 cubic feet of gas. The author discreetly leaves to the imagination the stupendous capital that would be required to establish such a gas-works for the production he anticipates; and also any small amount that would be wanted to purchase and modify existing works. Shall we put the total capital required at something like a trifle of £100,000,000 or thereabouts?

And when this is all done—in a megalomaniac imagination—*cui bono?* Will coal be conserved? Will power be more transmitted than at present? Will smoke be prevented? Assuredly not. For if such a scheme did effect any cheapening in the sales of gas (which it would not), this would obviously increase the demand, and so augment the consumption of coal and expedite the prophesied evil day of its exhaustion. Coal gas for power can even now be had from existing gas-works at something like the figure of Mr. Martin's "provisional estimate." With further legislative freedom, the removal of needless and hampering restrictions, and greater reduction in, or abolishment of, statutory illuminating power, the cost of gas for light, heat, and power from our present works would be very considerably reduced. And, lastly, as to general smoke prevention, that is a question that must be decided by considerations of individual economy and choice.

Effect of White Walls in a Photometer-Room.

A subject of interest to gas managers is dealt with by Mr. E. P. Hyde, in Bulletin No. 3 of the Bureau of Standards of the United States—viz.: The error produced in photometric work if the walls of the photometer-room are whitened instead of being painted with the time-honoured dead-black. According to the "Electrical Review," Mr. Hyde finds from exhaustive experiments that, with suitable precautions, the error produced is quite negligible. In all open-flame work, the errors introduced by the poor ventilation of the average photometer-room far exceed any arising from whitened walls, if suitable screening diaphragms are used with the latter. The tests were carried out in the photometer-room of the Bureau of Standards; the windows being covered with heavy curtains, and a series of black velvet diaphragms arranged so that at the Lummer-Brodhun photometer it was only possible to see the lamp under test or the comparison lamp, against which first the standard lamp, then the one being tested, and finally the standard lamp is again balanced. This substitution method eliminates all dissymmetry on the two sides of the photometer, and avoids the need of reversal of the screen. The results show that in this particular room the errors introduced by light reflected from the white walls are of the order 1 in 10,000, and therefore are quite negligible. On the whole, the results now obtained show that, with suitable diaphragms and screens, many apartments hitherto deemed wholly unsuitable may be used with success as photometer-rooms.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 56.)

THERE was not much improvement to be detected last week in the volume of business on the Stock Exchange. Apart from its being settlement week, which always militates against the opening of fresh business, the feeling of uncertainty and the want of confidence which have so long oppressed markets were still in full action, and were, moreover, reinforced by a new sinister development. After a very quiet opening, and a cheering anticipation of cheaper money, which was beginning to have a stimulating effect, everything was spoilt by the extraordinary Natal fiasco. Of course, sprouting prices were nipped at once by the frost, and the close threatened to be gloomy indeed. But, happily, the fall was arrested by the *volte face* of the Government. In the Money Market, there was a brisk request for the Stock Exchange requirements, and for the usual demands at the end of the quarter. But underlying these was the assurance of an early reduction in the Bank rate; and, indeed, it was regarded as far from improbable that the reduction might have come on Thursday. The postponement was perhaps not wholly uninfluenced by Colonial affairs. In the Gas Market, business showed no improvement upon the characteristics of the previous week. There was no augmentation of activity; and, in point of general tendency, the inclination was towards easier prices. The changes in quotation, however, did not amount to much either way. In Gaslight and Coke issues, the ordinary was very moderately dealt in, and prices gradually shrank. The best was 99 on Tuesday; but on Saturday 97¾ was marked—a fall of 1 in the quotation. The secured issues were proportionately inactive, but were unchanged. The maximum was done at 89¼; the preference at from 108½ to 109¼; and the debenture at 89¼ and 90. South Metropolitan was little dealt in, and was weaker; the quotation receding a point. Prices at which dealings were marked ranged from 128 to 129. The debenture was done at from 89¼ to 90. In Commercials, the only business was a couple of transactions in the 4 per cent. at 115. In the Suburban and Provincial group, Brentford old was done at 264 and 265 (a fall of 1 in the quotation), ditto new at 196, Brighton original at 234, British at from 44 to 44⅜, South Suburban at from 122 to 123, and West Ham at 108. Bromley "B," Lea Bridge, and West Ham preference rose 1 each; and on the local Exchange, Newcastle advanced. Among the Continental Companies, Imperial marked from 234 to 232½, Union 129, ditto preference 147; and both Europeans advanced, with business marked. Tuscan was done at from 10¼ to 10⅜—a rise of ¼ in the quotation. Among the undertakings of the remoter world, Bombay was done at 6⅞ and 7, ditto part-paid at 5⅛ and 5¼, Cape Town debentures at 54½, Monte Video at 11⅞, Buenos Ayres at 12⅞, Primitiva at from 7 1/16 to 7 3/16, ditto preference at 5 5/16 and 5⅜, River Plate at from 13 5/16 to 13⅝, Melbourne 4½ per cent. at 105¾.

The closing prices are shown in our Stock and Share List on page 56.

ELECTRIC LIGHTING MEMORANDA.

Domination of Parliament by the London County Council—The Power Bill of the Council only to go before Committee—Over-Competition and Future Prosperity—Attenuated Profits and Dividends and the Effect on Market Prices—The Local Government Board and Electricity Supply—Power and Lighting Charges.

THE new Parliament has shown its capacity for reducing Private Bill Legislation to a perfect farce. It has been known that the members of the House of Commons identified with the London County Council have been working most energetically to get the Council's Electric Supply Bill through its second reading and referred to a Committee, while the plan also projected that the privately promoted Power Bills should be rejected, or held in suspension. Whips were sent out; and everything has come off just as the Council ordained. It is not a pleasing spectacle to see Parliament dancing to the tune set by Spring Gardens; but that is what we have unmistakably come to. The County Council Bill, it was decided by the House on Monday evening last week, is to be referred to a Hybrid Committee, and the promoters of the private measures are to be, by the benevolence of the House, allowed to have *locus*, with the other opponents, to discuss the details of the County Council scheme. The effect on the scheme will be just about as much as the injury inflicted on a punching-ball as the result of a little exercise. The Committee are to be instructed, with special reference to this Bill, to consider the best means of providing for a supply of electrical energy in bulk and for power purposes, and to report thereon. "With special reference to this Bill!" Everything is so beautifully cut-and-dried, that the end of the Committee's labours is, it is apparent, already in the mould. We shall be pleasantly surprised if in the event it should not be so. We have, however, here a Parliament of such municipalistic proclivity, that, as between private enterprise and municipal trading, the scales of justice cannot be fairly held. "What is the objection," asked one member, "to sending all these Bills to the Committee?" The answer of the President of the Board of Trade ought to be underlined. "Because," he replied, "in a case of this sort,

priority ought to be given to the scheme of the ratepayers." Any comment upon a reply in which such undisguised preference is exhibited would be superfluous. We have yet to learn that the County Council have received any mandate from the ratepayers to prosecute the scheme; the Council have not even secured the unanimous support of the Borough Councils, which indicates as plainly as possible that they who are most intimately concerned have not confidence in the ability of the Central Council to do all they profess their intention of doing. How can it therefore be said, with any respect for the truth, that this Spring Gardens scheme is that of the ratepayers? The ludicrous argument was put forward by Mr. Lloyd-George, as a good reason for committing the ratepayers to this scheme of financial speculation, that the Borough Councils are supplying electricity at a cheaper rate than the Companies; and therefore we are expected to deduce from this that it will follow that the County Council will do still more wonderful things. The Borough Councils started with the support of the rates; and they are continuing now by the aid of an unreasonable and indirect support of their undertakings through the public lighting. Therefore, whatever advantage over private enterprise the Municipalities show in the supply of electricity to private consumers at a lower price, this is only due to the funds that are being drawn from the ratepayers. If the ratepayers only looked a little more narrowly into these questions, and saw how they are contributing to the lightening of the charges made by their representatives to those who are according to the Municipal undertaking their custom for electricity, they would certainly not give any credence to the sophistry of Mr. Lloyd-George in this matter, but would make such a protest against this extension of the Council's speculations in trying to attain the giddy heights of their ambitions that even the present Government would be made to pause.

If there was personal responsibility attached to these gigantic financial flights into business, the London County Council, as well as other authorities, would severely confine their attentions to their legitimate work. It is because of this absence of personal responsibility and liability such as has existence in private enterprise that causes municipal monopoly to be the worst form of monopoly. The action of some of the Borough Councils is a recognition of this. It has been mentioned that they are not unanimous, by at least half, in supporting the County Council in their reckless scheme; and the sole ground upon which they decline to be parties to the scheme is that they are apprehensive of the results of the risks in the already over-burdened Metropolis. The Finance Committee of the Council, too, have exposed the financial unsoundness of the scheme; but the head given by irresponsibility has carried the visionary projects along to the point at which the world has been shown how Parliament is now dominated by the County Council, and how willing Parliament is to give the Council its blessing. It is not a dignified position for the Government, nor an edifying sight for those who believed in the supremacy of Parliament. There has been plenty said in the past, and there will be abundant opportunity to supplement it in the future, as to the crude and hazardous character of the Council's scheme. In the present Parliament, the Council are being held up as, in this business, the Good Samaritans of the manufacturer and the ordinary electricity consumer, as well as of the Electricity Supply Companies and the Borough Councils. If this were indisputably true, the Council would not have taken so much trouble to secure that their Bill alone should go before the Committee. The Administrative Company have philosophically accepted the *locus*—holding that while there's life there's hope, and so it is better to get a look in before the Committee than to be immediately snuffed out. But the Additional Electric Power Supply Company are of a different opinion; and they can see no good whatever in expending time and money in what may be "a very interesting but academic discussion" which will lead to no practical result. Picture the position of the powerful Administrative Company when success was almost in their hands at the close of last session, and then their position to-day when they are contemptuously turned on one side to give a clear way for the County Council. Can it be denied that the proceedings of last Monday night are instructive of the power of the present Parliament to reduce Private Bill Procedure to a farce if it suits their municipal supporters? We think it cannot. The position is a serious one for the development of private enterprise in this country; and it will do much to impair the confidence which the investor of private capital has hitherto enjoyed under the protection of Parliament.

From the particular case of London to the general question. It is a matter for consideration whether we are not being electrically overdone now, and whether the liberty that has been, and promises to be further, given to electricity supply will not in the end do much towards bringing about an emaciated condition in the electricity industry, and strip it of the confidence of the investing public—that is to say if there is anything left shortly for them to invest in outside municipal borrowings. Competition is good in its way; but over-competition creates a condition of general and financial debility. The electrical industry has had a taste of this already in their plant-manufacturing section. And it is something of the same kind, but on a larger scale, which threatens if great supply monsters such as have been established are allowed to multiply and to suck the life blood from existing undertakings, and yet in so doing are unable to get enough for their own proper sustenance. The prospect of getting electricity at a cheap rate looks delightful for the existing consumer, and hearty welcome is held out to all those benevolent promoters—private and public—who offer this. But there is the future as well as the present, and the future holds financial distress for the electrical industry, if competitive licence is further indulged as it bids fair to be, instead of allowing the old undertakings to follow the course of natural development even if development demands amalgamation. Prosperity, too, has not been so responsive to the Electrical Power Companies in the country as the original schemes and prospectuses foretold it would be; and the knowledge will continue to grow that there are manufacturers who are, by the help of the private gas-engine, generating electricity right in the midst of these Electrical Power Companies, at a cheaper rate than the Power Company can supply at. The Chairman of the South Wales Power Distribution Company has just been bemoaning the difficulties encountered by that concern and the gradually fading brilliance of the predictions made before the works were started; and it is not an insignificant thing that since the previous meeting, three of the Directors, including such an influential man (particularly in the colliery world) as Sir William Thomas Lewis, have resigned. How the local authorities in the district with electrical undertakings trembled when this Company announced, in big type in the local press, that they were ready to supply at fractions of a penny per unit! The Chairman of the Company now says that, in getting custom, "delays and protracted negotiations have been very disappointing to the Directors; and he is sorry to say that their troubles are not yet at an end." He is also afraid that rather "a sanguine view had been taken of the early prospects of the Company." Capital has been expended which cannot for "some little time" become productive. The large station at Pontypridd is capable of accommodating some 20,000-horse power; but only 7500-horse power has up to the present been installed, and only "a small proportion" of this plant is required to deal with the existing load. If this means anything at all, it is that the South Wales Company are having a hard struggle to get custom; and what custom they can obtain is so much reduction of the scope for prospective business of the pre-existing undertakings.

And established electricity undertakings cannot afford to lose anything of the liberty for future business that they originally held; for many among them in such rich districts for business as are found in London are (in the face of competition and growing expenditure apart from the generating costs) finding it—the last-issued accounts show—difficult to uphold immediately preceding dividends. There has been a heavy fall over the past twelve months in the market prices of the shares of some of these companies; and the "Electrical Times" avers that the promotion of the London Power Bills has both directly and indirectly very seriously affected the prices of the companies' securities. That the promotion of the Bills has had influence, we are not by any means disposed to dispute; but there is something else assisting to account for the fall. The shareholders are not blind to the fact that the business that is now being done—even before the promised lands for prospective trading are annexed by others—is not of such a profitable nature as formerly. Though greater business is being done, a large capital expenditure is being required, upon which dividend or interest has to be paid, and the receipts per unit of output are smaller. The reductions, too, that compulsorily have had to be made in prices, have not been counterbalanced by economies in generation costs. It is seen in the list of comparative market prices that the greatest falls have been in the case of the Charing Cross, Kensington and Knightsbridge, and St. James' Companies; and it will be remembered that the shareholders of the first-named Company have had a drop in their dividend, and the shareholders of the last two have had to relinquish their bonus. Therefore, looking all round, there are indeed good reasons, in addition to competition for power supply, for the reported "very nervous and sensitive state of the market at the present time" in relation to private electricity companies.

While within the House municipalism is rampant, the Local Government Board and their Inspectors—it is at this time particularly satisfactory to find—are keeping a sharp eye on local authorities who come before them with fanciful and unpromising schemes, and upon those who treat with contempt the control of the Board. The Oldham Corporation have just had a taste of the power of the Board, who have declined to sanction over-expenditure and estimates amounting to upwards of £10,000 out of an application for £48,000. The criticism by an Inspector of the Board of a scheme brought forward by the Macclesfield Corporation, which scheme was described by him as a "skeleton" one, has led to its abandonment. Tiverton and Scunthorpe are not looked upon kindly by the Board as likely fields for the profitable employment of the ratepayers' money in electricity supply; and applications for loans there have been rejected. Boston (Lincs.) was served similarly not long since; and now the Board of Trade think it better a Company should be allowed to go in and take the risk. Then at Wisbech, the Council were ambitious; but the Local Government Board gently but firmly restrained them. A private Company are now to be given a chance. The Bridlington Town Council have had a loan of £5580 granted them for electric lighting works extensions; but the Board are of opinion that sixteen years is the term within which the money ought to be repaid. This will not suit those authorities whose affection for posterity is such that they desire to hand down for repayment

a decent balance of loans unrepresented by works. The Board have also found the Hebden Bridge District Council backsliding. They have exceeded their borrowing powers, paid the deficiency out of the district fund, and have been making departures from their scheme without first consulting the Board. In an application for a loan which has lately been made, cables laid two years ago were included. The Board have not yet announced how they propose to deal with this Council. Though municipal trading is entering upon a long and favourable innings just now, it is good to see the Local Government Board are inclined to ensure that the trading is conducted on proper financial lines.

At Watford some of the ratepayers are very much amazed over the prices the District Council are charging for power; and we are not surprised at this. The ordinary man cannot see where profit is to be made on a contract such as the Council have entered into, for the supply for power purposes of 100,000 units of electricity per annum at 1d. per unit, when the total costs work out to 2·02d. per unit, *exclusive* of capital charges. The 2·02d. was the average cost in 1904-5; and of that, 0·96d. was the cost of coal. Still the Council, on some deep-laid line of reasoning, say that 1d. per unit will be profitable. Naturally the lighting consumers who are paying 5d. per unit—and the lighting consumers we were recently told are the "backbone" of the electricity business—want to know what they have done, that they should be made to pay five times more than the power users, who are not the "backbone" of the business. If gas people followed the same lines of doing business, where 1s. 6d. per 1000 cubic feet was charged for power, there the price to lighting consumers would be 7s. 6d. per 1000 cubic feet; where 2s. was charged for power supply, 10s. would be the price to lighting consumers, and so on. The arguments of the electricians as to the value of a day load at the price of 1d. per unit in the case of such a concern as Watford are ingenious; but they do not satisfy most plain business men. They appear, however, to be good enough for a majority of the Watford Town Council, who we suppose accept them because they do not understand them, and acceptance is an easy way out of the difficulty.

PERSONAL.

Mr. F. M. DONNE, who has for some time past been Assistant Gas Engineer to the Midland Railway Company at Derby, has been appointed Locomotive Superintendent at Nottingham.

Mr. SAMUEL DAY, who has held the office of Secretary to the Mirfield Gas Company since 1859, is relinquishing his post, and going to reside at Bridlington Quay. The Company was incorporated in 1856, with a nominal capital of £15,000, divided into 3000 shares of £5 each.

Mr. A. B. SLATER informs us that he has taken the position of General Manager of the Gas Company at Rio de Janeiro, Brazil. He mentions that his New York representative will be Mr. F. S. Pearson, of No. 25, Broad Street, New York, but that all communications should be sent to Rio.

Mr. ALBERT WHITELEY, who has been employed for several years at the works of the Longwood Gas Company, has been appointed Manager of the Kirkburton Gas Company, in succession to Mr. Edward Shortt, who is going to Church Stretton. There were 118 applicants for the post.

The completion of twenty-five years' service by Mr. ALEXANDER MITCHELL as Manager of the Bury St. Edmunds Gas Company, was made the occasion for kindly recognition at the hands of the Board. At a recent meeting of the Directors, Mr. F. C. Andrews, the Chairman of the Company, said it was their wish that some slight acknowledgment should be made of the valuable services Mr. Mitchell had rendered, both to them and to their predecessors on the Board. He had, therefore, pleasure in asking Mr. Mitchell's acceptance of a silver cigarette-box, bearing the following inscription: "Presented by the Directors of the Bury St. Edmunds Gas Company to Alexander Mitchell, as a memento of 25 years' service as Manager, February, 1906. F. C. Andrews, Chairman; J. Floyd, Vice-Chairman; A. J. Hooper, T. Ridley, J. W. Greene, W. Chapman." Mr. Andrews expressed the hope that Mr. Mitchell would live many years to enjoy the confidence of the Directors and shareholders. Mr. Mitchell, in thanking the Directors for the gift, referred to the fact that during the last few years the conditions under which gas companies conducted their business had somewhat changed. Competition had now to be met which often made the duties of the manager more onerous and trying; but after all it tended to a healthier state of things as far as the interests of the public were concerned.

Engineership of the Beckton Gas-Works.

We understand that, as from yesterday, Mr. J. H. REESON took charge as Resident Engineer of the Beckton Station of the Gaslight and Coke Company. Mr. H. Iago, who has been at Beckton since 1902, will for the present manage the St. Pancras, Shoreditch, and Haggerston Stations of the Company. There have also been several minor changes of the assistants from one station to another. In connection with his departure from Beckton, Mr. Iago was presented on Saturday with a gold watch and chain suitably inscribed, and Mrs. Iago with a beautiful solid silver (table centre) rose-bowl and four candlesticks, as a mark of the officers' and men's admiration and esteem.

PRESENTATION TO MR. WILLIAM NORTH.

THE genial and cheery figure of Mr. William North, who for nearly forty years has been the Engineer and Manager of the Stourbridge Gas-Works, is known wherever those who are associated with gas manufacture are wont to gather together; and it was a very representative and happy company who assembled at the Talbot Hotel, Stourbridge, last Thursday evening, to wish him "God speed" on his retirement from business to his new home at Paignton, and to ask his acceptance of a token of appreciation from the members of the Council and of his many friends in business and private life. This mark of esteem was crystallized into the form of a magnificent silver rose bowl of massive proportions, together with an album containing an address and the names of the subscribers; while, by a happy inspiration, there were added a silver sugar-basin and cream-jug, which those who organized the proceedings asked Mr. North to accept as a gift for Mrs. North.

At the banquet Mr. North was spoken of as possessing perennial youth. True, he is as hale and hearty as ever; but he nevertheless feels that the time has arrived when he should set aside the activities and responsibilities of business. It was as far back as 1844—sixty-two years ago—that he first became identified with gas making; being articled in that year to the Gas Manager at Malton. In 1862 he left his native Yorkshire for the position of Manager at Bromsgrove, from which town he removed in 1867 to take up a similar position under the old Stourbridge Gas Company; and there he has remained ever since. When he went, the annual make of gas was 40 millions, of which quantity about 40 per cent. was lost through leakage. To-day the annual make is upwards of 190 millions, with a leakage, in a mining district, of less than 10 per cent. In addition to building up this big enterprise, Mr. North has entirely remodelled the works; and the only parts of the old premises left are the offices. It is not too much to say that Mr. C. H. Webb, M.Sc., who succeeds Mr. North, takes over one of the most replete gas plants in the Midlands.

But in addition to his local activities, Mr. North has long held a recognized position among the gas engineers of the country; and there are up and down England—and even beyond—many important works the planning and construction of which he superintended as Engineer. He served for many years on the Council of the Gas Institute, and, as our readers are aware, was for some time the Honorary Secretary of the Midland Association of Gas Managers. One feature of Mr. North's business career stands out prominently, and that is his ability to "get on" with those employed under him. At Stourbridge, his relationship with the staff of all grades has always been of the most cordial description; and before leaving the works for the last time he was presented with a silver salver and a salad-bowl by Mr. O. E. Gilmore, the Chief Clerk, on behalf of the employees.

The Banquet.

As already mentioned, a public banquet was held on Thursday evening, at which the gas engineering profession was represented by many old friends of Mr. North. The chair was taken by Mr. S. FIDDIAN, the Chairman of the Gas Committee, who was supported by a number of the public men of Stourbridge, as well as by Mr. F. J. North, Mr. R. H. Mobberley, Mr. Felix Fellows, Mr. A. Bird, Mr. Sidney O. Stephenson, Mr C. Dakin, Mr. H. F. Shaw, Mr. G. J. Eveson, Mr. A. E. Gilmore, Mr. F. Carter, and Mr. C. H. Webb (the new Manager). Apologies were received from a number of gentlemen who sent greetings and felicitations.

After the loyal toasts had been honoured,

Mr. WALTER JONES, who was one, if not the chief, mover in the acquisition of the gas-works by the Local Authority a dozen years ago, proposed "Our Guest." After paying a warm tribute to Mr. North's qualities of heart and head, he said that when they bought the works they had to pay more for their "whistle" than they anticipated, and more than some of them thought they ought to have paid. He remembered saying that one thing would be the salvation of the undertaking, and that was to increase the sales of gas by 10 per cent. for the first five years. He also expressed the belief that Mr. North could accomplish this. As a matter of fact, in five years the sales increased by a little more than 50 per cent. Possibly the Gas Committee sometimes thought they did the work, and that they were the important people; he used to think so when he was on the Committee. But he assured them that the Gas Manager was a very much more important man than some people credited. It was a very simple thing to make gas; but it was not so simple to buy the coals, and not quite so simple to sell the coke. In his opinion, Mr. North would not play second fiddle to any man in Stourbridge as a buyer. He had never known him to say a foolish thing or do a rash one; and if any man in Stourbridge had earned the laurels, it was their guest that evening. He thought they had really been a little belated, as they had only found this out when he was leaving the town and district. He congratulated the Committee upon preparing this testimonial to Mr. North, who was deserving of any recognition that it was in their power to make. This was his (the speaker's) honest and conscientious conviction. In conclusion, he expressed the earnest wish that Mr. North and his wife would, in their new home at Paignton, be blessed for many years to enjoy the rest they so well deserved.

The toast was received with much enthusiasm, and with musical honours.

The CHAIRMAN then made the formal presentation to Mr. North In

doing so, he said that, on behalf of upwards of a hundred subscribers, he had the greatest pleasure in asking Mr. North to accept a beautifully illuminated address in album form, to show the esteem in which he was held; and he hoped that when Mr. North came to look through it in his leisure moments, he would see inscribed the names of many of his old friends, and would remember with pleasure his association with them in Stourbridge. He also, on behalf of the same subscribers, had pleasure in asking Mr. North to accept a very fine silver rose bowl, not only as a token of the esteem in which he was held, and in appreciation of the eminent services he had rendered to the town, but also as a recognition from other friends who had met him in private life, and had equal reason to value his many kindnesses towards them. He had to mention that some ladies had subscribed to the fund; and this money was devoted to a presentation to Mrs. North, consisting of a silver sugar-basin, tongs, and cream-jug, in a case, in recognition of her many acts of kindness to the poorer section of the community in Stourbridge—acts which, as they knew, were performed quite unostentatiously. In conclusion, the Chairmain said they all joined in wishing Mr. North "God-speed." They would not say "Good-bye," as they hoped he would have many occasions to come to Stourbridge, when he would be received by his friends with every cordiality. Mr. North was leaving them full of years and honours; but that God might grant him many more years of happiness and peace in his future home was the ardent wish of every subscriber. (Applause.)

Mr. NORTH, who was most cordially received, thanked the meeting for their kindness towards him. Referring to his work in the Gas Department of the Corporation, he said that no doubt the town paid a big price —£112,000—for the gas-works when they purchased them. But he was going to tell them something which very few people knew. When they became possessed of the works, he assured them he felt "sick," because he could not see where the money was coming from to pay the interest and sinking fund. However, he got over the "sickness," and eventually he was quite as pleased as the Council were at the purchase. In the first year, they had a profit of £45 or thereabouts; and he remembered saying to Mr. Harry Mills, the then Town Clerk, that something must happen—the margin was too near to be safe. They set about moving, with the result now seen. In the first year that the Council had the undertaking, they made no progress; so that it was in nine years that they more than doubled the make, the sales, and everything else. This, of course, was quite satisfactory; but he was not aware that he deserved any particular acclamation for what he had done. Once and for all, he must say that he had simply done his duty. He had endeavoured to do so all the way through, and without fear or favour. It was all summed up in the words that he had done his duty to the best of his ability; and if he had well served the town, he was very pleased. He expressed to the Chairman, to the Committee, to the subscribers, and to all who had taken an active part in the reception and presentation, his sincere thanks. He thanked them for entertaining him, for giving him the elegant bowl and the beautiful album containing the names of many with whom he had been so long associated. He also thanked the subscribers for their handsome present to Mrs. North, who, he was sure, would be delighted with the gift. Continuing, Mr. North said he had just completed 39 years of service in the town; and at the close of his working life it was most gratifying to find they had found him worthy of such a splendid reception as they had accorded to him that night. He might say that during the long period during which he had control of the works, it was a very pleasurable time—the success of the undertaking added to the pleasure; and he was happy in the thought that he was leaving the works in a better condition than he found them. Whatever faults and failings he might have had, however harsh and hard he might have appeared sometimes to people in his dealings, he should like to say that he hoped they would forgive him; assuring them that whatever he did was always done under a strong conviction of duty. He wished his successor every success, especially hoping he would be equally fortunate in getting the confidence and trust of the Gas Committee and the Council. He personally felt it a great honour to be trusted; and for his last word he should like to say that, feeling that the Council trusted him, he had never betrayed the trust put in him.

The massive rose bowl of silver, standing upon an ebony plinth, bore the following inscription:

> Presented to William North, Esq., on his leaving Stourbridge, by his many friends in the town and district. March 29th, 1906.

Engraved on the front of the bowl were Mr. North's initials. The address was contained in a handsome album, bound in scarlet padded morocco, and was beautifully illuminated. The text was as follows:—

> To William North, Esq.
>
> Dear Sir,—We, members of the Urban District Council of Stourbridge and other of your friends beg your acceptance of the accompanying piece of plate, as a mark of our goodwill and personal esteem.
>
> We cannot permit you to leave this district without some appreciation of the eminent services you have rendered as Engineer and Manager of the Stourbridge Gas-Works. We recognize the indebtedness of the town to you for your devotion to its interests, and for the manner in which you have laboured to make the undertaking an extremely valuable municipal asset.
>
> In the course of a very long residence among us, you have made many friends; and it is our earnest hope that Mrs. North and yourself may be blessed with health and happiness in your new home, and that this small testimony of the regard in which you are held will recall pleasant memories, and be a happy reminder of old associations.
>
> S. FIDDIAN, *Chairman.*
> ARTHUR H. MOODY, *Secretary.*
>
> STOURBRIDGE, *March 29th.*

Then followed the names of the Committee: Messrs. F. P. Evers, W. Waugh, J. Ware, A. Moyle, Walter Jones, T. Penn, and H. Wilcox; the names of the subscribers; and a record that the presentation was made by Mr. S. Fiddian at a public dinner; and that the toast of "Our Guest" was proposed by Mr. Walter Jones.

Mr. W. FIDDIAN proposed "The District Council," to which Mr. J. WARE responded.

Mr. H. WILCOX next gave "The Gas Department."

Mr. ARTHUR MOODY, a member of the Gas Committee, in responding, said he thought the Committee were all conscious that they were in the hands of their Manager; and he hoped the same relationship which had existed between Mr. North and the Committee, to the benefit of the town, would exist between them and Mr. Webb, and that that night would be the beginning of mutual prosperity and happiness. On behalf of the Committee, he wished Mr. North a happy evening to a very busy and a very strenuous life. They hoped that in Devonshire he would be blessed with good health; that he and Mrs. North would have many pleasant recollections of their association with Stourbridge; and that Mr. North would still retain some measure of affection for the town in which he had spent so many years of his life, and would be able to congratulate both the Council and Mr. Webb upon the way in which both were carrying on the work he had laid down.

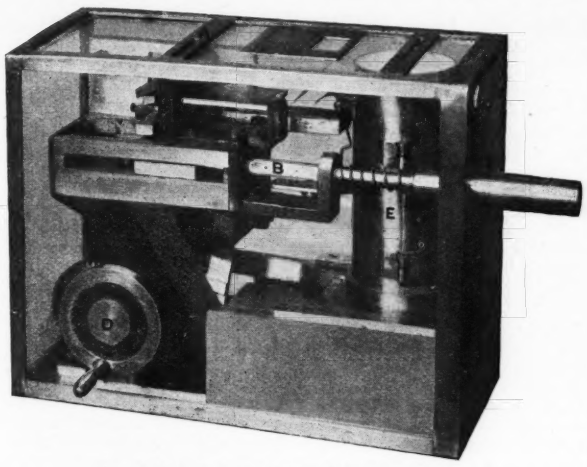
Mr. WEBB also replied to the toast. He said that, as a stranger, they did not want words from him, but deeds; and these they should have, to the best of his ability. He took the opportunity to publicly thank Mr. North for his great kindness towards him during the month he had been in the town. Mr. North had done everything he could to give him a fair start and a good grip of the management of the undertaking. In conclusion, he referred to the remarkable progress the undertaking had made during the time it had been possessed by the Council, and assured them he should spare no pains to make the output increase, and the concern as successful as it was under Mr. North.

MECHANICAL CHANGE-GIVER FOR PREPAYMENT METER CONSUMERS.

THE prepayment gas-meter system is accompanied by two or three troubles, which do not diminish with its extension in popularity. The consumer sometimes finds himself in the predicament of having a failing supply, and not a penny at hand; but this, in most households, must be a rare occurrence, especially as, where the prepayment meter is used, there the intimacy with copper coinage is no doubt greater than with coinage of higher value. Difficulty has also been found, in some working-class districts, where the prepayment meter is popular, through the great copper-absorbing power of these instruments of convenience; and, furthermore, when the meters are cleared, there is the difficulty of disposing of the great bulk of pence formed by the penny accretions, with the consequence that banks have to be "squared" with a moderate poundage to pay the expenses to which they are put in dealing with such an unusual form of custom. Then there is the labour involved in collection. Chairmen and officials of gas companies have filled their shareholders with amazement by talking of the hundredweights and tons of copper coins collected, carried, and dealt with by their staffs, and finally by the banks within certain periods. Weight adds to labour, and labour to the number of officials required for the purpose; and additions in these respects represent a greater increase in staff costs.

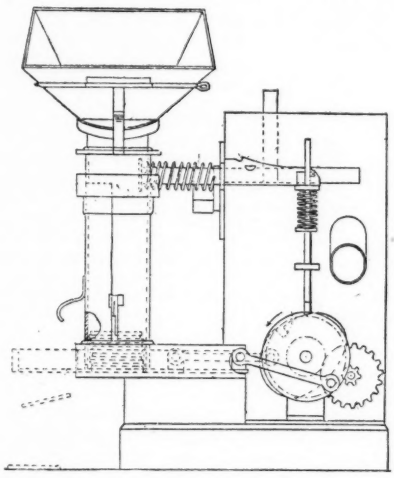
We see, upon this consideration of the subject, that the slot-meter consumer occasionally suffers inconvenience, and that cost is incurred in both collecting and disposing of the great bulk of copper coins accumulated in this branch of the gas business. The incorporation of change-giving mechanism in coin meters, we are told, is the remedy for the disadvantages and additional costs. By such mechanism, the consumer can obtain from the meter the pence for the coin—say, a shilling or sixpenny piece, as the case may be—for which the changer is made; and this has the automatic effect of getting rid of the other difficulties to which reference has been made, by reducing the quantity of copper coins to be dealt with. The idea of change-deliverers in connection with slot-meters is not new; but it is alleged, by the latest inventors, that the application of all prior coin-changers makes their use necessary to constant use of the meter—that is to say, unless a meter is relieved of its copper coins when they total to a certain amount, by changing them for coins of a higher value, a supply of gas cannot be obtained. This is a disadvantage that is overcome by Messrs. Hancock, Spann, and Herbert in connection with a change-giving apparatus an example of which we have now before us, and upon which the first remark must be that the device is an exceedingly clever one, and can be made for changing coins of any one value.

Before making a few additional general remarks on the question of utility and cost, the mechanism of this new coin-changer may be shortly described. It can, we believe, be incorporated in prepayment meters of any design; and therefore it need only be assumed for present convenience that the mechanism under notice is for changing shillings. A sliding carrier B is provided, and in connection with it a coin slot A, so arranged that when a shilling is dropped into the slot, the coin lodges in a slot in the carrier so as to project therefrom. By sliding this carrier longitudinally, the coin is carried along with it, but falls away through a shoot C, at the end of the stroke into a coin receptacle inside the apparatus. In proximity to the carrier is a slide, having an arm which projects into the path of the projecting part of the shilling, so that when the carrier is slid by hand longitudinally, the shilling coming against the projecting arm also moves the slide. When it gets to the end of its stroke, the shilling falls away through the shoot; and the carrier automatically travels back by the action of a spring. The slide has an inclined plane on its edge, adapted to act as a locking-bar, and in proximity



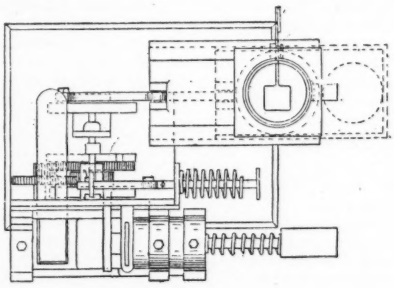
The Model Apparatus (Detached) in Glass Case.

to the locking-bar is a cam or eccentric having a slot at one point in its circumference, in which the locking-bar engages. This cam is mounted upon a shaft, which is provided with an external handle D, but which remains normally locked by the locking-bar engaging in the slot of the cam. On a shilling being dropped through the slot, however, and the carrier being pushed in, with the consequent operation of the slide, the locking-bar will be lifted out of engagement with the cam, and will thus



End View of the Change-Giver.

permit of the shaft being rotated by the external handle. The cam or eccentric is not secured directly to the shaft, but is mounted with a reducing arrangement formed of a series of gear wheels, arranged in such a manner that the cam performs one revolution to twelve turns of the handle. The device is provided with a column E, adapted to receive, and continue in a vertical pile, the pennies that are inserted in the prepayment meter. An indicator is provided, and is visible from the outside, to show when the column contains (say) twelve pennies or more. Be-



Plan of the Change-Giver.

neath the column is a sliding push, working in suitable guides, and provided with a cavity about the same diameter, and of the same depth, as a penny. The bottom penny in this pile drops into this cavity; and the sliding push is coupled by a connecting rod to a crank on the shaft, so that, for each rotation of the shaft, the sliding push will make one forward and return stroke. Thus for every turn of the handle, the sliding push will travel forward, deliver the penny that has dropped into the cavity, and then return, so as to enable the next penny in the pile to slip into the cavity, and the delivery operation be repeated. An arrangement is provided at the top of the column, so that, when it is full of pennies, the ones at the top can overflow into a coin-box inside the apparatus. This suffices as a general description, and (without going into the minor details) shows the ingenious design of this change-giving apparatus.

Reference has been made to the utility of such a device as this; but utility is not the only question for the administrators of gas undertakings. They have to take the commercial view, and see whether the convenience that they give to their customers, and the comparatively small expenses they save themselves, are a full justification for initial and maintenance outlays, and afford a profitable investment. We may say at once that we are not satisfied that the incorporation of such devices in the prepayment system would be either justified or profitable, but are not unwilling to be shown that the view is a mistaken one. The increase of mechanism must mean additional capital cost, and increased charge for maintenance, because, in regard to the latter, any increase of mechanism means not only additional parts subject to wear and tear, but an increase in the liability to derangement. Allusion has been made to the utility to the consumers; but it must be admitted that the utility is limited. Each apparatus must be confined to giving change for a coin of one particular denomination. Say the mechanism is made for changing a shilling, then, if the consumer has not a copper, he must be the possessor of a shilling, because a sixpence will not operate the instrument, and a florin or half-crown will not pass through it; and the times prepayment consumers would be without shillings would in all probability have greater frequency than when they would be without pence. In our trials with the mechanism, too, it has been found that there must be more than twelve pennies in the receiver before the indicator points to the position where the change can be brought into use. This is another limitation to convenience.

On the whole, therefore, while expressing admiration for the cleverness of the device and the excellence and beauty of the mechanism (mechanism of the kind costs money), we cannot think that the limited use would justify the expense of general adoption. The tendency is to try to decrease the cost per prepayment installation, and not to increase it. Therefore, our opinion must be that the managers of gas undertakings will not look very favourably in the direction of the cost-increasing application of change-giving mechanism.

GAS-ENGINE PROBLEMS.

At a Meeting of the Royal Society on the 15th ult., Mr. Dugald Clerk read a paper, communicated by the Hon. Charles A. Parsons, on "The Specific Heat of, Heat Flow from, and Other Phenomena of, the Working Fluid in the Cylinder of the Internal Combustion Engine." According to an abstract of the paper in the Engineering Supplement to "The Times," the author said he proposed to describe experiments made with a gas-engine of 60 brake-horse-power, designed to obtain data necessary for a more complete theory of the internal combustion motor, and also to discriminate between the effects of continued combustion in a gaseous explosion and specific heat change at temperatures between 200° and 1500° C. The new method of experiment consisted in alternately compressing and expanding the highly-heated gases within the engine cylinder while cooling proceeded, and observing by the indicator the successive pressure falls and compression and expansion curves from revolution to revolution. From some 200 indicator cards, taken under varying conditions, there had been calculated: (1) A curve of apparent specific heat of the gaseous contents at constant volume between 200° and and 1500° C.; (2) curves of heat loss to the enclosing walls; and (3) distribution of heat in the working cycle calculated from diagrams only. The apparent specific heat at constant volume was proved to increase from 22 foot-pounds per cubic foot at 200° C. to 27·4 foot-pounds at 1500° C.; and an examination of expansion curves and specific heat determinations made at different engine speeds and jacket temperatures showed that combustion was proceeding, and accounted for a part of the apparent increase of specific heat. The curves of heat loss showed that, for equal temperature differences, heat loss per unit surface exposed increased with density. From these curves, the mean temperature of the cylinder walls had been calculated, and shown to vary at full load from 190° C. for the whole stroke to 400° C. for the three-tenths stroke. Calculations made of heat distribution in the working cycle of the fluid, showed that the total heat present in the form of combustible gas could be accurately calculated from the indicator diagram alone by means of the new data obtained in the investigation.

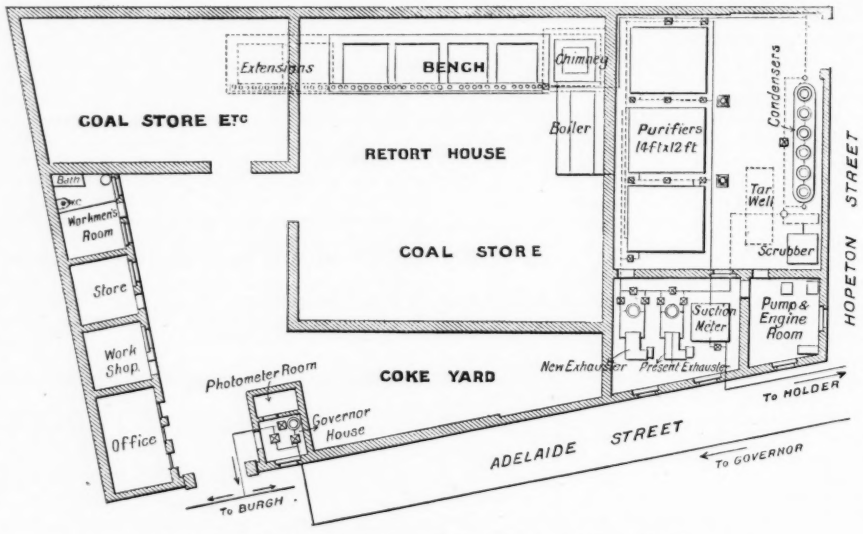
The Société Technique du Gaz en France and the Syndicat Professionel de l'Industrie du Gaz, which is associated with it, have contributed a sum of 3000 frs. towards the fund now being raised for the relief of the sufferers from the Courrières mining disaster.

GOUROCK CORPORATION GAS-WORKS.—COMPLETION OF THE RECONSTRUCTION SCHEME.

Last Thursday the formal ceremony took place of inaugurating the reconstructed gas-works belonging to the Corporation of Gourock. Although the town is small—the population being less than 6000—the gas-works are situated in an exceedingly congested part of it, and on a site where it would be extremely difficult to obtain space for extension. On this contracted site works have been erected which are distinguished for simplicity and neatness of design, and the making of the most of every available inch of the ground. The Engineer was Mr. James M'Gilchrist, of Dumbarton, whose son, Mr. John M'Gilchrist, was recently appointed Manager of the works. Consideration of the scheme of reconstruction was begun about three years ago, when Mr. James M'Ewen was Manager; and the work proceeded under his care until his death in August last.

In designing the works, Mr. M'Gilchrist had great difficulty—on account of the want of room and of the necessity for keeping the works going—in disposing of the different parts of the plant; and as matters of fact, the new retort-house and coal-store have been built directly over a disused gasholder. The work has now been all but completed; the portions remaining to be dealt with being the governor-house and the weighbridge, and the completion of the store-rooms, workshops, and workmen's room. The only part of the old works which has been left standing is the retort-house. All the rest, even to the boundary walls, is new. The old retort-house is to remain; and on the gable dividing it at present from the new house being removed, it will be used as a coal-store. The old chimney is also to remain, and is to be used to carry off the steam from the quenching apparatus—an arrangement which is all the more desirable owing to the circumstance that the works are surrounded by dwelling-houses. The portion of the old works remaining is built of grey sandstone, in ponderous style, even in ashlar, and is in great contrast to the new buildings, which are of birch, light in structure, in accordance with modern tastes; a finished appearance being given to the portions requiring it by the addition of a modelled red sandstone coping. The roofs are all of corrugated iron. The cost of the restoration, when completed, will be nearly £8000.

The principal entrance is in Adelaide Street, at the higher level, where coal will be conveyed into, and coke removed from, the works. There is a side entrance in Hopeton Street, by which lime for purification will be taken in and out. The office—a neat little apartment—is situated on the left of the Adelaide Street entrance. To the right is to be the governor-house and the



Plan of the Gourock Town Council Gas-Works as Reconstructed.

coke-yard. In the old retort-house there are five ovens—two of sixes and three of fives—all of small size. In the new house there are four ovens—two of eights and two of sixes—of larger size; in fact, one oven is said to be capable of producing as much gas as the entire bench in the old house. They are built on Hislop's patent regenerative principle. The annual output of the works is about 30 million cubic feet, with a maximum daily output of 130,000 cubic feet. The new works are capable of producing about 300,000 cubic feet per day—more than double the present output. A steam-boiler has been built at the end of the retort-bench by Messrs. Penman and Co., of Glasgow, and encased in white enamelled brick, giving the house a bright appearance. The condensers consist of six annular tubes, with bye-pass, erected by Messrs. J. F. Blakeley and Co., of Dewsbury. The scrubber is the patent one of Messrs. Henry Balfour and Co., Limited, of Leven, Fife; and the steam-engine driving it, in the adjoining building, is by the same firm, and is a very smart piece of mechanism. In the same room are two steam plunger-pumps for tar; the tar-tank being overhead, and the tar-well below the yard separating the purifier-house from the condensers. It may be stated that provision has been made for drawing off tar at the works; but the general method of delivering it will be by pipe, down the slope to the railway—the fall being such that it is possible to discharge 2000 gallons into railway waggons in the course of ten minutes. The exhauster-room is also under the tar-tank. This part of the plant, with the steam-engine driving it, has been supplied by Messrs. R. & J. Dempster, Limited, of Manchester. The exhauster and the compensator beside it have been very prettily treated with aluminium-coloured paint. The capacity is 15,000 cubic feet per hour. In the same room is the circular station meter, supplied by Messrs. James Milne and Son, Limited, of Edinburgh, and capable of registering 12,000 cubic feet per hour. In the purifier-house, which is open on one side, there are three boxes, 13 ft. by 14 ft., fitted with a M'Gilchrist valve, by which one, two, or the three boxes can be worked. The Contractors were Messrs. Balfour and Co. Only lime is used, the store for which is over the purifiers. A patent hopper, running upon an overhead rail, is employed, in conjunction with a canvas shoot, for filling the purifiers through hatchways in the floor. A plate upon the front wall of the exhauster-house narrates that the gas-works were reconstructed in 1905-6, during the time when Mr. James Adam was Provost, and Judge Duley was Gas Convener; Mr. James M'Gilchrist, of Dumbarton, being the Engineer.

The Inaugural Ceremony.

When the invited company assembled in the retort-house, Provost ADAM, in a short address, informed them that the new works had been designed with the intention of efficiently serving the burgh for the next fifty years.

Judge Duley and Provost Adam then took part in the charging of a retort, and the stokers showed the method of stoking a regenerative furnace. Thereafter Mr. James M'Gilchrist conducted the party round the works, explaining the working of the different parts. At the conclusion of this part of the ceremony, the company were conveyed to the Ashton Hotel, where dinner was served.

Provost ADAM said he had been deputed to speak to the company about the old gas-works. They were started about fifty years ago by a Company, upon the site still occupied. There were then two small iron retorts. Only one man was employed, and he did all the work, both inside and outside the works. Even then he had too much spare time, and got into bad company, and had to be discharged. The next Manager was a Mr. Horsburgh, who also carried on the business of gas-fitter and tinsmith. He was granted an assistant, who, in his spare time, turned the waste ground inside the works into a beautiful garden, where the finest flowers and vegetables were grown. In 1862, Mr. James M'Ewen was appointed Manager, Collector, and Secretary; and he continued to act in this capacity for many years, with only one assistant. At that time the most serious difficulty gas managers had to encounter was the disposal of the residual products, which became a burden and a nuisance. A pipe was laid down from the works to the sea-shore, and the liquid residuals were run into the sea. The Harbour Trustees commenced an action against the Gas Company, who had to adopt other means to get the stuff taken away. No one would have anything to do with the lime. Farmers thought it would poison their cattle and kill their crops. But after seeing the effect upon the flowers and vegetables within the gas-works, they began to make experiments; and soon changed their opinions; and what had been scorned before was now in great request. The gas undertaking, which at first had had

so many troubles, was now a splendid property; and it continued to prosper. In 1886 it passed into the hands of the Town Council, by the payment of about £9000; and a considerable sum had since been expended upon the works and mains. It was his duty to leave Judge Duley to deal with the new works; but he said he should like to refer to Mr. M'Ewen, who was for upwards of forty years their Manager. He was a faithful servant, first to the Company and then to the Corporation. He laboured day and night to make the undertaking a success, and did it. He had now been taken from them; but the Corporation of Gourock, and the community as well, would long remember him as a kindly, good, faithful, and industrious man.

Judge DULEY, speaking of the new works, said it was on March 31, 1886, that the gas undertaking passed into the hands of the Town Council, and it was somewhat remarkable that they should, within two days of twenty years from that date, be celebrating the opening of the new works. In the first year of the Corporation management, the revenue was £734; last year it was £5248. Before they had decided upon the scheme they had just carried out, they discussed whether they should patch up the old works or go to a new site, or whether they should reconstruct upon the old site. They decided upon the last; and he thought that none of them, after having seen the works, were sorry that they had done so. In the new works they could store about 1000 tons of coal under cover, which would be a great saving. The work had been carried on successfully, without a hitch; and he thought a great deal of credit was due to their young Manager.

MARIENDORF FIVE-METRE VERTICAL RETORTS.

Herr E. Körting, the Manager of the Berlin works of the Imperial Continental Gas Association, has communicated to the "Journal für Gasbeleuchtung" the following report on the Mariendorf vertical retorts.

The Mariendorf settings of vertical retorts have been in uninterrupted work for some months, and have given quite satisfactory results. In order to be able to establish with precision the quantity and quality of the gas made in these settings, special experimental gas-works of 210,000 cubic feet per diem productive capacity were erected, and equipped with a laboratory, photometer-room, &c.

The vertical setting is much more easily and simply controlled than an inclined setting. The heat was always good and uniform; and the retorts did not get out of shape. The same remark applies to Dessau, where they have been under fire for 7½ months. It may therefore be hoped that the retorts will have a very prolonged life, especially in the upper cool parts of the setting. In any case, the setting of 5-metre (16½ feet) retorts has now been proved as practicable and trustworthy at that of 4-metre (13 feet) retorts. The coke was always of the same conspicuously good quality. Samples which have been disposed of to central heating stations have obtained the hearty approval of the purchasers. This leads to the expectation that coke from vertical retorts will fetch better prices than ordinary gas coke. The difference is particularly noticeable with Saar coal.

We found that 100 lbs. of coal, mostly English, yielded 4·2 lbs. of tar, of which the characteristic properties appear from the following comparative results of distillations:—

Temperature of Distillation	Distillate Yielded by the Tar from	
	Vertical Retorts.	Inclined Retorts.
0°—100° C.	8·9 p.ct. oil, 5·7 p.ct. water	1·0 p.ct. oil, 0·85 p.ct. water
100°—170° ,,	1·2 ,, ,, — ,, ,,	1·6 ,, ,, 1·85 ,, ,,
170°—230° ,,	13·5 ,, ,, — ,, ,,	7·5 ,, ,, — ,, ,,
230°—270° ,,	7·3 ,, ,, — ,, ,,	10·27 ,, ,, — ,, ,,
Above 270° ,,	29·3 ,, ,, — ,, ,,	18·80 ,, ,, — ,, ,,
,,	34·1 ,, residue.	58·13 ,, residue.

It is evident that with tar of such good quality the horizontal gas exits (which correspond with the old ascension-pipes) from the retorts and the hydraulic main will remain quite free from accumulations of thick tar.

In December the yield of ammonia was 0·334 per cent. in the vertical retorts, against 0·224 per cent. for the average throughout 1905 in the settings of inclined retorts at Mariendorf, which shows an increase of 0·11 per cent., or roughly one-half as much again for the vertical retorts. At present prices, this would correspond with an increased return of 0·85d. per 1000 cubic feet of gas made, or (say) £3125 for the yearly output of a Mariendorf retort-house.

The following table shows the carbonizing results:—

Description of Coal.	Time under Carbonization.	Weight of a Retort Charge.	Make per Ton.	Gross Calorific Power of Gas.
	Hours.	Pounds.	Cubic Feet.	B.T.U. per Cubic Foot.
Ruhr	12	1452	11,350	587½
Silesian	10·3	1247	11,500	601
English (No. 1)	11·16	1408	11,800	610
,, (No. 2)	11·4	1386	10,440	620½

The low specific gravity of the Silesian coal reduced the weight of the charges with it, and thus, notwithstanding the short carbonizing time, affected unfavourably the make of gas per retort per diem. The Ruhr, Silesian, and No. 1 English coals gave quite normal results; but the No. 2 English coal was a poor one for gas making, as analyses also proved. The high calorific power of the gas it afforded was, however, some compensation for the low make. When English coal is carbonized, more water gas could be produced in the retort without reducing the calorific power of the gas below a certain minimum value. The following comparison, taken from the averages for the months of November and December, of the calorific values of the gas from vertical, inclined, and horizontal retorts, is instructive:—

Calories per Cubic Foot.

Vertical.	Inclined.	Horizontal.
603½ ..	583 ..	569½

In horizontal retorts, a large space must be left free above the charge of coal for the use of the drawing rakes. The gas passes away slowly, and suffers injury in respect of its calorific power. The inclined retort can be much more fully charged; and it yields more gas in unit time. The results are thus more favourable, notwithstanding the greater length of retort. The highest rate of flow of the gas, and therewith the highest calorific power, have been achieved with the vertical retort.

The following table gives, in conclusion, the results of an analysis of the gas made in vertical retorts:—

Calorific power, gross	609½ B.T.U.
Carbonic acid	1·6 per cent.
Oxygen	0·4 ,, ,,
Hydrocarbons (C_nH_m)	3·8 ,, ,,
Carbonic oxide	6·7 ,, ,,
Hydrogen	57·5 ,, ,,
Methane	26·8 ,, ,,
Nitrogen	3·2 ,, ,,

These results fulfil the best expectations. Experiments are now being made on the generation of water gas in the retorts; and it is hoped that thereby yet more favourable results will be achieved.

MECHANICAL CLEARING OF ASCENSION-PIPES.

In the notice of the recent visit of members of the London and Southern District Junior Gas Association to the Vauxhall station of the South Metropolitan Gas Company, which appeared in the "JOURNAL" for the 13th ult. (p. 728), reference was made to a machine in use there—the invention of Messrs. G. C. Trewby and A. S. Biggart, and manufactured by Sir William Arrol and Co., Limited—for clearing ascension-pipes. The machine, which was described and illustrated in the "JOURNAL" for March 11, 1902 (p. 637), was first tried at Beckton; but some difficulties were found to attend its working. Various improvements were suggested, and they have been embodied in the later machines constructed, one of which is illustrated in the current number of "Engineering." From the accompanying description, we learn that the present design of the pipe-cleaning shaft is the result of considerable experiment. Toothed ferrules strung on a wire rope, with ball-and-socket joints to take the thrust, were very successful; but it was subsequently decided to build up the shaft of a number of sections, knuckle-jointed, and therefore flexible, as this was found to adapt itself readily to inequalities in the pipe. Moreover, experience showed that a variation in the speed of the rotation of the shaft became necessary, as the tarry deposit was sometimes hard and tenacious, at others stiff and gluish, or soft and easily removable. Consequently, one uniform speed could not give the maximum efficiency. It was accordingly decided to arrange differential speed-gear in connection with the rotation of the shaft. In order to admit of lateral motion for driving the shaft up the ascension-pipe by the hydraulic cylinder at the rear, the wheels for rotating the shaft are mounted on a sleeve, into which the shaft is keyed by a sliding feather. The shaft is driven forward through the sleeve and up the ascension-pipe by means of the horizontal hydraulic cylinder; and the sleeve and shaft are rotated by a triple-cylinder hydraulic motor working a countershaft, on which are pinions gearing into the spur-wheels on the sleeve.

Masonic.

The Installation Meeting of the Evening Star Lodge, No. 1719, was held at the Gaiety Restaurant, Strand, last Wednesday, when a large number of brethren and visitors were present. Bro. F. W. Cross, the Engineer and Manager of the Lea Bridge Gas Company, was installed as W.M.; W. Bro. T. H. Martin, of Barnet, being re-appointed Treasurer of the Lodge, and W. Bro. W. D. Child, of Romford, Secretary. The other officers appointed and invested were: W. Bro. W. T. Dunn, S.W.; Bro. Glover Clark, J.W.; Bro. Jacques Abady, S.D.; W. Bro. W. A. Surridge, J.D.; W. Bro. A. E. Broadberry, D.C.; Bro. Cyril G. Davis, I.G.; Bro. C. W. Offord, Organist; Bro. W. Edgar, S.S.; Bro. Samuel Cutler, Junr., J.S.

Bro. Adam Cooke, the General Manager of the Urban District Council of Oldbury Gas Department, was installed W.M. of the Godstone Lodge, No. 2385, also on Wednesday last, and entered on what promises to be a most successful year of office. Among the officers invested by Bro. Adam Cooke was Bro. Sidney O. Stephenson, of Tipton, who was given a Stewardship.

COAL CONSERVATION, POWER TRANSMISSION, AND SMOKE PREVENTION.

At the Meeting of the Society of Arts last Wednesday, a paper dealing with the above subjects was read by Mr. A. J. MARTIN, M.Inst.C.E. It was to a large extent on the lines of the author's contribution to the Smoke Abatement Conference held in London last December, and noticed in the "JOURNAL" at the time. The following are some extracts from the paper.

The supreme importance of husbanding our coal resources will, I think, be conceded by all. Not only is coal the chief source of the artificial light and heat which have become so essential to our comfort, if not to our life itself, but it is at once the mainspring of the gigantic system of manufactures by which we earn our daily bread, and of the mighty fleet which enables us to hold our place among the nations. Our coal supplies may, without exaggeration, be described as the foundation of our national greatness. May we not further say that our very existence as a nation depends on them? How, then, are we dealing with this priceless national asset, and how long may we expect it to last? These questions formed the subject of a prolonged and exhaustive investigation by the Royal Commission on Coal Supplies, which was appointed towards the close of 1901, and issued its final report in January of last year. As the result of an extensive series of calculations, made by witnesses intimately acquainted with the various districts, the Commissioners estimated the available quantity of coal in the "proved coalfields" of the United Kingdom at 100,914,668,167 tons. The consumption, which in 1870 was 110 million tons, had increased in 1904 to 232 million tons. The rate of increase for the 34 years averages 2·2 per cent. per annum, equivalent to the doubling of the output every 32 years. If the consumption should continue to increase at the same rate, a simple calculation shows that the supply in the proved coalfields would last just over a century—to be exact, to the autumn of 2012. The "concealed and unproved coalfields" are estimated to contain a further supply of 39,485 million tons, which, at the same rate of increase in consumption, would last another 14 years, or 122 years in all. But referring to the supply in these unproved coalfields, the Commissioners significantly remark that they have "thought best to regard it only as probable and speculative."

In putting forward the foregoing figures, I do not suggest that our stock of coal will come to an end in 108 or 122 years, as the case may be; these periods being merely those required to exhaust our resources if the present rate of increase in consumption is maintained. That they will not be exhausted within any such period is obvious; but what is practically certain is that at no very distant date a cheap and abundant supply of coal, such as we enjoy to-day, will have become a thing of the past. Looking at the matter from its ethical side, it may well be questioned whether we, as mere tenants for life and trustees for the generations to come, have the right to squander their share, as well as our own, of an inheritance which has taken untold ages to accumulate, and which, once lost, can never be replaced.

It is not merely for power, light, and heat that we have to look to our coal mines, for they have also a most important bearing on our national food supply. For the greater part of a century, the wheat grown in this country has been utterly inadequate to our needs, which we have had to supply from abroad. The countries from which we draw our supply of wheat are rapidly filling up, and will before long—possibly within the next thirty years—require the greater part, if not the whole, of their products for their own people. Then, as Sir William Crookes pointed out in his Presidential Address to the British Association in 1898, a wheat famine will set in, unless the productiveness of the soil can be increased by the use of chemical fertilizers. The nitrogenous manure which is most generally used just now is nitrate of soda, of which large quantities are imported from Chili. It is estimated that the supply of this substance, at the present rate of consumption, will be exhausted in less than fifty years. Then, as Professor Crookes informs us, our only chance of averting starvation lies through the laboratory. There is an alternative manure for wheat land—namely, sulphate of ammonia—which is one of the chief bye-products in the manufacture of gas from coal, and contains nearly 30 per cent. more nitrogen than is present in nitrate of soda. The strange part of the whole business is that, while we spend something like £15,000,000 per annum in getting nitrate of soda from Chili, we waste at least an equivalent amount of nitrogen by our primitive methods of using coal. There is yet one other direction in which the squandering of our coal resources involves a heavy loss to the country—namely, in connection with what are known as coal-tar products.

Dealing with the wastefulness of existing modes of consuming coal—taking up successively the losses incurred in the production of power and heat, and basing his remarks on the investigations carried out some time ago by Mr. G. T. Beilby, a Past-President of the Society of Chemical Industry—Mr. Martin showed that the most efficient steam-engine is considerably less efficient than a gas-engine, and that, to utilize the amount of heat contained in a pennyworth of coal, the user has to pay 2s. 3d. or 7s. 0¾d., according as he requires it for heating or cooking purposes. He said that in the latter case he paid the price of a ton of coal at the pit's mouth, and obtained in return the heat units from a pennyworth. This was irrespective of the cost of labour in laying the fires, carrying coals, and cleaning grates, which in most houses came to far more than that of the coal itself. He added that the coal economies suggested by Mr. Beilby, while requiring some capital expenditure for their attainment, would in most cases be so great as to repay this outlay in a very few years. The chief obstacles to the more general adoption of the necessary improvements were due partly to lack of time on the part of the persons concerned to attend to the matter, but in still greater measure to that almost "passionate dislike of innovation" which is so characteristic of the English and of the Chinese.

The question of transport was next considered, and the transmission of power by electricity and compressed air dealt with. From the latter subject Mr. Martin passed on to the transmission by gas, and compared it with the two systems just referred to. On this matter he said: The advantages of gas over air for the transmission of power are overwhelming. Working at a pressure of 6 atmospheres, as is done in Paris, a good motor requires some 550 cubic feet of air per indicated horse power per hour; in a gas-engine, 14¼ cubic feet of ordinary lighting gas will do the same work. The specific gravity of the latter gas being only ·4 (taking air as unity), the volumes of the two fluids carried by the same main will be in the proportion of 16 : 10, if the initial and terminal pressures respectively are the same in both instances. This, however, would not be the case; for, whereas with air a small part only of the initial pressure is employed for transmission purposes—every pound of pressure consumed in this way being so much less available for working the motors—in dealing with gas the whole power of the compressors may be used to force the gas through the pipes, the power to be realized at the receiving end depending, not merely on the pressure of the gas as received, but chiefly on its calorific value. By reason of these various advantages, a main and compressor plant dealing with gas will transmit no less than 150 times as much power as could be sent by means of air. Add to this the fact that the use of compressed air is practically limited to the production of power, whereas gas serves also as a source of light and heat, and it will be seen that the commercial possibilities of compressed air, great as they are, dwindle into insignificance beside those of gas. In comparison with electricity, also, gas comes out very favourably; and it is upon its great superiority in point of adaptability and convenience that the case in favour of gas mainly rests. For lighting purposes, as well as for power production, the two run a close race. For heating, except in certain special applications, gas has it all its own way, chiefly by reason of the enormous losses (amounting to close upon 90 per cent.) which have to be incurred in obtaining electrical energy from coal. The weakest point of electrical transmission, however, is the absence of any means of storing energy on a large scale at anything like a reasonable cost. Owing to this, the whole of the generating, converting, and transmitting plant must be capable of supplying current at the greatest rate at which it is liable to be called for at any moment, and an ample reserve of capacity must be provided in case of the breakdown of any part of the system. Gas, on the other hand, can readily and cheaply be stored in any desired quantity for as long as may be desired, and used at any moment and in any quantity without deterioration or loss. It would only be necessary, therefore, to lay down manufacturing, compressing, and transmitting plant on the scale required to satisfy the average demand, and the whole of it might, if necessary, be shut down for a time without interrupting the supply.

Seeing that gas transmission possesses so many solid advantages, the question naturally suggests itself, Why is it not more generally used? The reason is, as Mr. Martin explained, that down to very recently it has not been considered possible to convey gas with any success over long distances. Sir William Siemens suggested it many years ago. Professor Unwin, in his Howard Lectures on the "Development and Transmission of Power from Central Stations," delivered before the Society of Arts in 1893, pointed out the advantages of gas distribution over distribution by compressed air or electricity. At least three of the witnesses before the Royal Commission on Coal Supplies proposed the use of gas for transmission purposes—one of them (Professor Burstall) going so far as to suggest that the producing plant should be located at the pit's mouth. Other authorities, however, whose opinion it was impossible to ignore, have characterized the proposal to pipe gas from the coalfields to the Metropolis as impracticable. There are many reasons why it should have been so regarded. To begin with, coal gas was first brought into use simply as an illuminant; and down to very recently this has been its most important function. Its value for illuminating purposes has depended on the presence of certain hydrocarbons; and experience had seemed to show that the proportion of these was reduced when the gas was subjected to pressure. The lack of efficient compressors and of pipes and joints capable of withstanding, without excessive leakage, the pressures which would have had to be employed, also constituted very serious obstacles to the long-distance transmission of gas. Dealing with these difficulties in order, and taking first the question of the loss of illuminating power, further experience has shown that gas can be subjected to considerable pressures without

suffering any serious falling off in this respect. Moreover, the illuminating value of gas is not now, as a rule, dependent on its own luminosity, but is obtained by the use of refractory earths in the form of mantles.

Great strides have of late years been made in the design and manufacture of air compressors; one of those used in the Paris compressing station having a total efficiency as high as 77 per cent. Steel pipes capable of carrying high pressures are now on the market; and modes of jointing have greatly improved. Not only so, but pipes are obtainable in 28 feet lengths, as against 9 feet thirty years ago; so that one sound joint now takes the place of three indifferent ones. As the result of these improvements, the dream of the man of science has now become an ordinary engineering achievement. In the United States, 4,000,000 people are supplied with light and fuel for all purposes by natural gas, conveyed under pressures up to 300 lbs. per square inch to distances ranging up to 200 miles. High pressures are also employed in connection with manufactured gas—the gasholder in one instance being supplied under pressure from a manufacturing plant no less than 35 miles away. The Western United Gas and Electric Company of Illinois supply 24 cities and towns, with a combined population of 140,000, and an extreme distance between centres of 52 miles.* At present, there are four principal and one small gas-works connected with the one pipe system; but the small plant will soon be shut down, and arrangements are on foot for supplying the whole territory from a single generating station. Mr. H. L. Rice, the Manager of the Company, states that already a plant is being developed to transport manufactured gas 200 miles to a large American city. While we cannot in this country point to any such striking instances of long-distance transmission, Nuneaton has a system of high-pressure mains supplied at a pressure of 9 lbs. from a holder receiving gas at 40 lbs. pressure.† The question, therefore, is no longer whether gas can be conveyed at high pressures, but simply whether it will pay to do so in any particular case.

Before taking up this subject, Mr. Martin offered a few remarks on the cost of Mond gas, water gas, and coal gas. Quoting the evidence of Professor Burstall before the Royal Commission on Coal Supplies, he showed that, on account of the value of the sulphate of ammonia recovered per ton of slack being about 75 per cent. of the value of the raw material, the Mond Company are able to sell their gas at the low price of 4d. per 1000 cubic feet, and even as low as 2d. for large quantities. Against this is to be set the fact that its calorific power is only about one-third that of coal gas. He pointed out that while producer gas and water gas are admirably adapted for heating purposes, they do not compare favourably with coal gas for long-distance transmission. This is chiefly due to their lower calorific value, necessitating the use of a much larger quantity to get a given amount of heat. By reason, moreover, of their greater density, more power must be expended to force an equal volume of any of them along the mains. These characteristics of the different gases, and their influence on the cost of transmission, are shown in the following table: —

—	Coal Gas.	Water Gas.	Mond Gas.
Cubic feet per pound	33·7	26	16
Heat units per cubic foot	617	328	144
Quantity equivalent to 1000 cubic feet of coal gas	1000	1884	4285
Cost of manufacture (excluding interest on capital) per 1000 cubic feet	4·89d.	3d.	1d.
Cost of making equivalent quantity	4·89d.	5·65d.	4·28d.
Cost of compressing ,,	0·39	0·74	1·68
Cost of transmitting ,,	0 44	0·95	2 76
Net cost of equivalent quantity delivered	5·72d.	7 34d.	8·72d.

The table showed, said the author, that Mond gas, in spite of its initial advantage in cost, was in the end the most expensive of the three; coal gas being decidedly the cheapest. The price of gas in London was undoubtedly high—ranging from 2s. to 3s. per 1000 cubic feet. This was due to three causes: (1) The large capital invested; (2) the requirements to which the gas has to conform as regards illuminating power, &c.; and (3) the high price of coal.

Dealing with these causes in order, the author said: The large investment of capital is the natural result of the slow growth of a great industry from small beginnings under changing conditions; but the return on this capital, which for the year 1904-5 was only 3·85 per cent., cannot be regarded as excessive. The only hope of a reduction in this item of cost lies, therefore, not in any lowering of the dividends, but in an increase of the supply, so that the same gross charge may be spread over a larger volume of business. Experience shows that any reduction in the price of gas at once stimulates the demand; and there is good reason to believe that when, as in the case of the gas supplied by the South Metropolitan Company, the price is as low as 2s. per 1000 cubic feet, any further reduction will be followed by an extremely rapid extension of its use for cooking, heating, and the production of power. The requirements to which the gas companies are subject as regards illuminating power date from the time when, the light obtained from gas being derived from the gas itself by the incandescence of carbon particles, it was important that a due proportion of the constituents furnishing these particles should be present. Now, however, that the function of gas, as generally used for lighting purposes, is merely to heat a mantle to incandescence, the illuminating power loses its importance, and the restrictions which were originally adopted for the protection of the consumer now constitute a heavy and unnecessary tax upon him. Many of the gas companies are fully alive to this, and are doing their best to get the regulations modified to suit the conditions of the present day. Parliament has in several instances relaxed the requirements in question; the consumer reaping an immediate benefit in the reduction of the price of gas, generally to the extent of 1d. for each unit of reduction in the candle power. Within the past fortnight, the Cardiff Gas Company have obtained a reduction in illuminating power from 16 to 14 candles, and in respect of it the maximum price chargeable within the borough has been lowered from 3s. 6d. to 3s. Reductions aggregating 2d. and 4d. respectively will take effect within the next few months. It is time that the general body of gas consumers woke up to the fact that some millions of pounds per annum are extracted from their pockets for which they receive no return; the sole justification for this extortion being that it enables a diminishing body of consumers to go on using their grandmothers' gas-burners.

Having dealt with two of the causes mentioned, Mr. Martin passed on to the third—the high price of coal—with which, he said, he was more nearly concerned in considering the long-distance transmission of gas. On this point he spoke as follows: The coal on hand in the Gaslight and Coke Company's yards at the end of June, 1905, was valued at 13s. 4d. per ton; and it is probable that this is not far from the average cost to the London and Suburban Gas Companies of the coal they use, delivered in their yards. From an examination of various official returns and published prices, it would appear that the coal in question was not worth, on an average, more than from 6s. or 7s. at the pit mouth, or one-half of its cost delivered to the retorts. It follows from this that carriage, handling, and incidental expenses account together for something like 6s. 8d. per ton of coal, which, allowing 10,000 cubic feet of gas per ton, works out at no less than 8d. per 1000 feet. It remains to be seen whether gas can be transmitted at a lower rate. The cost will depend very materially on the scale on which it is undertaken. A supply of gas equivalent in heating value to the 15 million tons of coal consumed by the Metropolis every year can be conveyed from the South Yorkshire coalfields—a distance of (say) 173 miles—by a single line of 6-feet pipe, with an initial pressure of 480 lbs. per square inch; or, not to depend on a single main, by four lines of pipes ranging from 3 feet to 6 feet in diameter, with a pressure of 510 lbs. It would not, however, be necessary to supply so large a quantity, for gas, by reason of its higher practical efficiency, would take the place of a much larger amount of coal than would appear from a comparison of their respective calorific values. The actual amount of gas which would be required depends on so many conditions, the effect of which cannot be estimated with any approach to accuracy, that it is impossible to say, even approximately, what it is likely to be. In view of all the facts, however, it is reasonable to suppose that the consumption of gas in London might be increased to four or five times its present amount. Whether or not this rate is actually reached, or whether it is exceeded, the difference in the scale of operation will hardly be such as to make any material difference in the cost. For the sake of a tangible example, I have assumed a consumption of 180,000 million cubic feet per annum, representing a maximum demand of 900 million cubic feet per day. It would be prudent to have four mains, each to be laid with 30-inch pipes throughout; the thickness varying from one end of the line to the other as the pressure dropped. The weight of gas conveyed per minute would be 4637 lbs. per main, or 18,548 lbs. in all; being about 80 per cent. of the carrying capacity of the four pipes, with initial and terminal pressures of 500 lbs. and 250 lbs. respectively. The weight of each line would be about 82,000 tons, or 328,000 tons for the four; and their cost at current prices would be as follows:—

Pipes, 328,000 tons, at £15	£4,920,000
Add for wrapping in tarred canvas, at £1 per ton	328,000
Cartage, at (say) 7s. 6d. per ton	123,000
Jointing and laying, 3,680,000 feet, at 1s.	184,000
Excavation, 1,226,667 lineal yards, at 4s.	245,333
Valves, specials, &c. (say)	59,667
Engineering and superintendence, at 10 per cent.	586,000
Contingencies, at 10 per cent.	586,000
Total	£7,032,000

To this must be added parliamentary expenses and cost of wayleaves, the amount of which it is exceedingly difficult to assess. By way of making some allowance for these items, I have carried in the round sum of £1,000,000; bringing the total initial cost to £8,032,000. The annual cost of transmission (exclusive of compression) would be as follows:—

Interest on £8,032,000, at 6 per cent.	£481,920
Depreciation on £7,032,000, at 4 per cent.	281,280
Inspection and repairs (say)	10,000
Rates and taxes (say).	5,000
Total	£788,200

To compress a maximum supply of 625,000 cubic feet of gas per minute to a gauge pressure of 500 lbs., requires about 207,000

* "JOURNAL," Vol. XCII., pp. 679, 682. † *Ibid.*, Vol. LXXXVI., p. 652.

ndicated horse power. Under ordinary circumstances, this would be most economically obtained by means of producers and gas-engines, which, at 0·8 lb. per indicated horse power per hour, would consume some 355,000 tons of coal per annum. The power plant might be conveniently arranged in units of 5000-horse power each; each colliery feeding the line having its own compressor station, containing as many units as might be required. The compressors should be direct-driven, and, to avoid unnecessary loss of power, should work in three stages. In view of the unusually large scale of the power plant; and the consequent lack of data on which to base an estimate, the following particulars of initial and working expenses for a compressor plant of 250,000 indicated horse power have been specially obtained from a leading firm of engine builders:—

450 boilers, each evaporating 10,000 lbs. of water per hour, including setting; 75 feed-pumps; 50 direct-driven compressing-engines (each of 5000-horse power); steam-pipes, &c., 10 travelling cranes; building flues and stacks	£2,014,000
Land, roads, &c. (say)	83,200
Engineering and supervision, 10 per cent.	201,400
Contingencies, 10 per cent.	201,400
Total	£2,500,000

The following table shows the annual cost of compression; steam being raised with the waste heat from the retort-settings:—

Interest on £2,500,000, at 6 per cent.	£150,000
Depreciation and repairs, £2,014,000, at 5 per cent.	100,700
Attendance on boilers and feed pumps (stoking charged to retorts)	3,750
Engine-room staff, 42 units, at £250	10,500
Oil and waste, 42 units, at £130	5,460
Management, 10 stations, at £600.	6,000
Sundries (say)	13,590
Total	£290,000

Spreading the annual costs of compression and transmission over 180,000 million cubic feet of gas, they work out as follows:—

Compression	£290,000	= 0·39d.	per 1,000 cubic feet.
Transmission	778,000	= 1·04	,, ,,
Together	£1,068,000	= 1·43d.	,, ,,

Taking the value at the pit's mouth of the coal consumed in London at 8s. per ton (the average for the whole country being 7s. 1d.), and the average price paid by the consumer at 20s., the cost of conveying and distributing the annual supply of 15 million tons works out at £9,000,000. In comparing this cost with that of gas transmission, it should be borne in mind that the calorific value of the gas in question is barely one-fourth that of the coal. It is apparent, however, that, whatever estimate may be formed of the relative efficiencies of coal and gas, there will remain a substantial margin in favour of the latter. As compared with the 8d. per 1000 feet which it costs to convey coal for gas-making purposes, gas transmission shows a saving of 82 per cent.

Having referred shortly to the utilization of the terminal pressure, Mr. Martin proceeded: In considering the question of removing the manufacture of gas from the Metropolis to the coalfields, the question of the effect of the change on the cost of manufacture will naturally come up. The first consequence obviously will be the saving of the cost of the carriage and handling of the coal, less that of compression and transmission. A second result of no mean importance will be the utilization of the dust and small coal which will not bear the cost of transport, but which nevertheless are perfectly suitable for gas making. As a matter of fact, the South Metropolitan Gas Company at the present time use a grade of coal which has generally been looked upon as inferior, and which apparently approaches in quality the waste coal now in question. Of the money value of the latter, various estimates were given before the Commission. One witness spoke of the fuel in the Mond producer as "common small coal which would be worth 3s. to 4s. per ton at the pit's mouth." Another, speaking of the value of colliery waste, estimated it at "perhaps 1s. 6d., 1s. 9d., or 2s. per ton." There seems to be little doubt that a very large quantity of this material, well suited in all respects for gas making, could be had at (say) 3s. per ton. But in view of the advisability, on general grounds, of understating rather than overstating the case in favour of gas transmission, I have estimated the cost of the coal to be used for gas making at 6s. per ton.

The next step is to ascertain the cost at which gas can be made. This question is far too intricate to be definitely dealt with by an estimate, even if my technical knowledge were sufficient to justify me in forming one. I propose, therefore, to take the cost of gas as now manufactured in existing works; substituting 6s. per ton for the actual cost of the coal used at each. The following are the corrected figures: Colne, 2·45d.; Lancaster, 0·91d.; Leigh, 2·07d.; Stourbridge, 1·88d.; Widnes, 1·97d.; Wigan, 1·42d.—average, 1·78d. The corrected cost of gas at Lancaster comes very near the lowest—viz., 1d. per 1000 cubic feet—of which I have any record; the gas in the case in question being obtained as a bye-product at some chemical works. I propose, therefore, to take 1·78d. per 1000 cubic feet as the provisional net cost of manufacture. Now, £30 per 1000 cubic feet per day is a liberal estimate for manufacturing plant; the interest on which at 6 per cent. comes to 36s. It has been stated that, with proper attention to repairs, no allowance need be made for depreciation; but, to be on the safe side, 2 per cent. may be set by for this purpose, which will replace the cost of the plant in 28 years. With interest and depreciation together amounting to 48s., and an output, per 1000 cubic feet maximum capacity, of 200,000 [? million] feet per annum, these charges work out at 2·88d. per 1000 cubic feet. Management and rates and taxes, I have provisionally set down at 1d. per 1000 cubic feet. An allowance of 10 per cent. should be ample to cover leakage from both the transmitting and the distributing systems.

To arrive at the price at which gas might be expected to be delivered to the consumer, it remains to add the cost of distribution and management and the companies' profits. The gas now supplied to London costs about £364,000* per annum to distribute; and the existing mains are probably capable of conveying, at pressures not exceeding those used in some other towns, the whole 900 million cubic feet of gas per day. If, however, we allow for distribution twice the above-mentioned figure, it works out to 0·97d. per 1000 cubic feet. With no manufacturing plant to look after, the £782,000* per annum now set aside for management, rates, taxes, bad debts, and miscellaneous expenses should continue to cover these items. Spread over 180,000 million cubic feet, it works out at 1·04d. per 1000 feet; while the gross profit of £1,638,000* now earned by the Companies comes to 2·18d.

On the basis of a make of 10,000 cubic feet of gas per ton of coal, the following is a provisional estimate of the ultimate cost of gas in London:—

Net manufacturing cost at the pit's mouth, per 1000 cubic feet made, taking coal at 6s. per ton (obtained from average of six lowest actual costs)		1·78d.
Interest on cost of manufacturing plant, 6 per cent. on 3s.		2·16
Depreciation, 2 per cent. on 3s.		0·72
Management, rates, and taxes (say)		1·00
Cost of gas per 1000 cubic feet delivered to compressors.		5·66d.
Compression	0·39d.	
Transmission	1·04	
		1·43
Cost of gas delivered in London		7·09d.
Allowance for leakage in course of transmission and distribution, 10 per cent. of total, adding 11·1 per cent. to above		†1·79
Cost of gas per 1000 cubic feet sold		†7·88d.
Distribution (twice present cost), management, rates and taxes, bad debts, and miscellaneous		2·01
Profit, as at present		2·19
Ultimate selling price		12·08d.

† These figures are as given in the published paper.—Ed. J.G.L.

Grouping the various items of cost into one statement, it appears that on the basis described gas might be delivered into the present gasholders for just over 7d. per 1000 cubic feet, and sold to the consumer at about 1s.

Other factors which would come in to reduce the cost of production, and of which no account is taken here, are the abolition of the standard of illuminating value, such relaxation as may seem advisable in the standards of purity, the combination of the manufacture of furnace coke with that of gas, the utilization of the steam from the compressor engines for the production of water gas, and others which will readily occur to the gas engineer. Any of these, acting alone, would bring about an appreciable reduction in the cost of the gas; taken together, they would admit of a very considerable lowering of its price. There can be no question that the reduction in the price of gas to anything like 1s. 6d. per 1000 cubic feet would bring about so large an increase in the demand, that further reductions would speedily ensue, with the result that nearly the whole of the coal at present consumed in London would be displaced by gas. Even for the generation of electricity, gas at 1s. 6d. would cost less than the coal now consumed by 23 out of the 25 of the Metropolitan electrical undertakings; while Hackney's fuel bill (the lowest of them all) exceeds the equivalent of gas at 1s.

Mr. Martin concluded by referring to the incidental consequences of the supersession of coal by gas transmitted as proposed by him; one of the principal being the abolition of the smoke nuisance, and the getting rid of the abnormal blackness and persistence of London fog. He explained that though, for the sake of definiteness, he had hitherto dealt with the matter solely in its relation to London, there was no reason why gas should not be piped in the same way to every city and town in the kingdom. To inland towns paying 18s. or 19s. per ton for their gas coal, cheap gas would be an even greater boon than to London, with its seaborne supply. Nor need the benefits of cheap gas be confined to the towns, for there was no reason why the trunk mains should not be tapped at any desired point along the route. The cause of industrial decentralization could be given no greater stimulus than it would receive from the provision of light, heat, and power at a minimum cost along every foot of the pipe-lines from the collieries to the Metropolis. Whether or not his proposals were accepted in their entirety was, he said, a matter in which he did not feel any great concern; for, however his hearers might disagree with him as to details, he trusted they would support his three main conclusions: (1) That no time

* In the absence of full information as to the details of cost in the case of the smaller companies, the figures given in this paragraph are taken as proportional to those reported by the three London Companies.

should be lost in taking effective measures for the conservation of our coal resources; (2) that the best hope of effecting substantial economies in consumption lay in the prevention of overlapping wastes by the co-operation of various classes of consumers; and (3) that in all coal-consuming establishments systematic provision should be made for recovering and utilizing the valuable bye-products. He asked that the whole question should be dealt with on broad lines.

Discussion.

The CHAIRMAN (the Hon. R. C. Parsons, M.A.), in opening the discussion, said that, speaking generally, the question of the prevention of smoke in London was one of very great importance to every individual; but it remained to be seen whether Britishers were as far advanced as they ought to be in giving up the pleasures of their open fireplaces. There was no doubt that, in order to clear the atmosphere of the Metropolis, the adoption of gaseous fuel was an absolute necessity; but it was a question whether gas could be burnt in gas-stoves in such a way as to give the heating power required at a reasonable cost. The author of the paper had thrown out some most valuable suggestions in regard to the supply of cheap gas, which he thought could compete with coal burnt in open fireplaces. The question immediately under discussion was whether the gas should be produced at the coalfields or in the vicinity of London at a price to meet the requirements. If it was made near London, there was no reason why the atmosphere should be blackened, as the combustion of coal was so perfect with mechanical stokers that it was very rare for black smoke to be seen at the top of chimneys. Owing to the adoption of incandescent mantles, coal gas could now be produced at a more economical rate than formerly, because, as the author had explained, the adoption of oil for the purpose of increasing the illuminating power was less important than it was before the mantle was adopted, and they used their "grandmothers' burners." It was, however, a most difficult question to decide whether coal gas could be compressed to a pressure of 500 lbs. per square inch, and transmitted economically in a pipe-line to London, because a large portion of the gas, being hydrogen, made its way through the very smallest leakages in the pipes. They had found this to be the case in America, where the pressure did not go above 300 lbs. per square inch; and it had been necessary to surround the pipe-line with another pipe, so that the gas which had leaked would be caught and pumped back into the mains. In America it was natural gas, and the leakage had been very considerable. It was a very moot question whether gas could be transmitted in the manner suggested by the author; nevertheless, the principle on which he had been working was, in a measure, not upset by that difficulty, because gas could be produced in the neighbourhood of London and then transmitted for the purposes required.

Mr. W. D. SCOTT-MONCRIEFF said about twenty-five years ago he read a paper at a meeting of the Society of Arts on the subject of doing away with the nuisance of smoke in London; the chair on that occasion being occupied by Sir Robert Rawlinson. The proposal which received the greatest attention at that time was one made by Sir William Siemens, that coke should be used in domestic fires, and it was suggested that, as coke was rather difficult to light, and did not give a very cheerful appearance, it should be supplemented by the use of gas. This proposal had been again revived, and was referred to at the recent conference on the subject of Smoke Abatement. The passing of the twenty-five years since he read his paper had produced the condition that any hopes with regard to the improvement of the domestic grate had been entirely dissipated, and most people agreed that bituminous coal could not be burnt in a grate and be practically smokeless. The proposal at the time was that the existing gas companies had a sufficient amount of plant available for doing what was necessary if they extracted only 3000 cubic feet of gas per ton out of their coal, instead of 10,000 cubic feet, as this would give rather more than three times the amount of fuel available in the form of coke. Sir Robert Rawlinson, who was at the time a Director of one of the Companies, requested the Engineer to make some experiments in this direction; but it was found that the practical difficulties in the way of carrying out such a scheme were insurmountable, because at the period of extraction represented by 3000 cubic feet of gas, a great nuisance would have arisen from the escape of large volumes of smoke from the retorts. As a matter of fact, no evidence had been available to show how far such a scheme was really impracticable; and if it was the case that it would provide a remedy, it would be quite worth while to attempt to discover whether the difficulties were insuperable. He pointed out at the time that fuel resulting from an extraction of 3000 instead of 10,000 cubic feet of gas per ton had 20 per cent. more calorific value than the latter; but he did not think any estimate had been made of the calorific value of coal during different periods of extraction. Although it was difficult to get such a scheme as he proposed carried out without funds available for the purpose, it must be remembered that the gas companies at that time were more prosperous than they were just at present, and paid handsome dividends. But they were in a very different position now, and were making great efforts to improve their dividends by taking an intelligent view of all proposals brought forward that offered any prospect of success. With regard to the details of the paper, he considered that a pressure of 500 lbs. per square inch upon four pipes running from the Midlands was a very heroic proposal; and if leakage occurred in America with only 300 lbs. pressure, that arising from 500 lbs. pressure would not only be greater, but the technical difficulties of producing the pressure would be enormously increased.

The SECRETARY (Sir H. Trueman Wood) thought it would be of interest, in connection with the last speaker's remarks, if he stated that Sir William Siemens designed a stove which had been working for the last twenty years in a most satisfactory manner in his (the speaker's) office at the Society of Arts. It was intended to burn gas and coke; but, as a matter of fact, coal was always used. The stove was most economical and convenient. Neither wood nor paper was used in lighting it; a little coal being put in, and the gas then turned on. It was probably only due to the fact that the stove was not patented, and that nobody had "pushed" it, that it was not at present the most popular stove in existence, instead of being represented by the one solitary example in his own room.

Mr. M. ATKINSON ADAM said the question of the transmission of gas seemed to resolve itself into one of loss by leakage. The Chairman had suggested as an alternative that, instead of the transmission of gas, the transmission of coal would not be so serious a problem. If he remembered rightly, the figures quoted for the price of coal in connection with the Administrative County of London Electric Power Bill in the course of last year were somewhere between 6s. 6d. and 7s. 6d. per ton delivered in London. If the transmission of coal to London was as cheap as that, it was a serious question whether anyone could reasonably support a scheme for the transmission of gas at high pressure, with all its attendant difficulties. The author had suggested several devices for the utilization of the gas at the receiving end; for instance, the running of motors from a high-pressure gas supply resulting in an expansion down to temperatures below freezing. In his opinion, these schemes were impracticable. He did not know whether the author had studied what would happen in the case of the expansion of the gas at such low temperatures, having regard to the hydrocarbons carried in the gas. His own impression was that large deposits would take place, which would have a serious effect on the utilization of the gas in motors. One feature in favour of the proposal for the transmission of gas was the concentration of all the generating apparatus on one spot, which undoubtedly lent itself to a very great conservation of valuable forces, and therefore effected great savings. But he greatly doubted whether these would pay for the losses which must take place in transmission. The figures the author had given as the price which would be charged for the gas at the delivery end were not very different from those which had been advocated by many people as possible with the existing gas undertakings if the limit as to the illuminating value of the gas was removed. His partner, Mr. Dugald Clerk, had been pressing for many years for the removal of this limit, which would be a very great benefit to the community; and the figures he had mentioned in various papers that gas companies should aim at were the very figures mentioned by the author—viz., 1s. and 1s. 6d. per 1000 cubic feet. As a matter of fact, coal gas was now supplied in England at 1s. per 1000 cubic feet at Widnes, Sheffield, and other places; and this was another reason for doubting whether the transmission of gas under pressure was desirable, if the margin was so small. Even in London, the South Metropolitan Company supplied gas at about 2s. per 1000 cubic feet, which was not very much greater than the 1s. 6d. mentioned by the author, and this in face of the difficulty that they had to supply the gas of a fixed illuminating value.

Dr. F. H. BOWMAN remarked that the question of the production of heat was a very important one in a large number of industries. The best effects could only be obtained where the gas was produced at the point where it was used immediately along with the heat given off by the products of combustion. If it was cooled down and carried a distance, so large a portion of its effect would be lost that it would not pay for transmission. He considered the suction gas-producer had revolutionized the question of the production and substitution of gas. Even if he gave 24s. and 25s. a ton for coal, he could produce in heat units gas much cheaper than the cheapest gas that was mentioned by the author, transmitted over a distance. In the transmission of the gas, one thing which would, of course, occur was that it could not always be utilized exactly at the time it was produced; and in order to make gas cheaply, the process must be continuous and not intermittent. An immense quantity of storage would be required for a pipe system; and this would be a very serious drawback. The author had stated that he hoped gas might be delivered at 1s. per 1000 cubic feet. In his own case, he put down a gas plant, and when he had sold the residuals for use in his own works he produced gas of 14-candle power at less than 1d. per 1000 cubic feet. He offered to supply a neighbouring village with this gas; but, as the authorities there had a gas plant of their own, they declined his offer, because they thought it would interfere with their monopoly. At a properly constructed works, it was quite possible, with the present price of coal, to produce gas at a cheaper rate than 1s. per 1000 feet, even in London.

Mr. BENNETT H. BROUGH thought that the author, in his statement that at no very distant date a cheap and abundant supply of coal would have become a thing of the past, had taken too pessimistic a view of the future of British coal supplies, in view of the conclusions of the Royal Commission.

Dr. L. T. THORNE said that 25 years ago he took up the question of the production of gas with the view of utilizing that made in the existing works. He thought a great deal of the criticism of

the author's figures had been rather exaggerated. They seemed to him to have been worked out carefully, and were based in all cases on a maximum of 1s. per 1000 cubic feet, which, in his opinion, could be considerably reduced. It had been suggested that coal could be obtained in London at 6s. 6d. and 7s. 6d. per ton. He did not think there were many manufacturers in the Metropolis who were in the happy position of being able to get coal at this price. His own firm paid an average of 13s. 6d. or 14s. 6d. per ton. The author had estimated that he would save from 5s. to 7s. per ton in the cost of the transport of the coal; and if the figures were carefully gone into, it would be found that the figure of 6s. 8d. given would not be very much above the extra price paid in London for coal compared with the price paid at the pit's mouth. He quite agreed with the remarks which had been made as to the practical difficulties of transmitting gas over long distances at very high pressure.

Dr. RIDEAL thought the question whether leakage could be satisfactorily overcome was an engineering problem. Most people were agreed that gaseous fuel in some form or another had considerable advantages, especially when a reduction of illuminating power would enable the gas manufacturer to produce a gas of greater volume at a cheaper cost. Gas of low illuminating power would have a calorific value not proportionately reduced compared with the higher lighting value, and would be capable of compression to the high pressure suggested by the author without losing its volatile constituents, and therefore would be capable of being transmitted in the way suggested.

Mr. MARTIN, in reply, said he was fully conscious that the novel and radical proposals he had put forward in his paper had special difficulties. There had undoubtedly been a large amount of leakage in transmission systems hitherto, but very great improvements had of late years been made in pipes; and although, as the Chairman had pointed out, the pressures proposed were much greater than those which had been worked with in the past, and the leakage would be greater, not in proportion to the pressure, but to the square root of the pressure, these greater pressures enabled very much larger quantities of gas to be transmitted. Therefore, although there was a greater absolute leakage, yet the percentage of leakage was not necessarily larger than with lower pressures. The main fact to which he desired to draw attention was that, in spite of the difficulty which had been referred to by various speakers, gas was still supplied under heavy pressure. With regard to the question of deposits raised by Mr. Adam, he quite recognized that if they worked with such gases as had been used in the past—with gases which depended for their luminosity on a certain proportion of complex hydrocarbons—deposits of a serious nature would probably occur. But this question had been answered to a certain extent by Dr. Rideal. Mr. Adam had raised the point that the suggested proposals did not offer any very great advantages in regard to the price of gas above what had been proposed in the case of that made in London, and had said that if the regulations fixing the illuminating power were removed, the London gas might be sold at a very much lower price. This was so; but it was not fair to compare London-made gas with restrictions removed with pit-mouth gas made under restrictions in force at the present time. If the saving in the cost of manufacture of the London gas was to be deducted, it must also be deducted from the cost of the pit-mouth gas. He agreed that the figures he had given were not tempting. If he had desired to write a sensational paper, many of them could have been cut down from 20 to 50 per cent. For instance, he had taken the net cost of manufacturing gas at the pit's mouth at 1¾d. per 1000 cubic feet; whereas Dr. Bowman had stated that he had made 14-candle gas from expensive coal at less than 1d. per 1000 cubic feet. So that, if the matter was gone into closely, it would be found that the cost of 1s. per 1000 cubic feet delivered in London might admit of a very considerable reduction. Mr. Brough had said that he (Mr. Martin) had taken too pessimistic a view of what was going to happen in the future in regard to the supply of coal. He desired to point out that he had expressed no opinion whatever on this point. He had simply said that if the rate of consumption went on increasing as it was doing at the present time, the supply of coal would be exhausted in 108 years. In conclusion, he desired to repeat that he was not concerned with particular proposals, but simply said that something ought to be done, in the interests of later generations, to conserve the coal resources of the country.

A vote of thanks was accorded to Mr. Martin for his paper.

Writing to the Secretary of the Society of Arts, expressing his regret at his inability to be present to hear Mr. Martin's paper, Mr. George Beilby said: "It is just 21 years since I read a paper to the Society of Arts on 'The Process of Fuel Gas and Ammonia Making,' which is now called 'Mond.' The industrial world was not ripe for it at that time; but to-day I hope these national developments will have a better chance." Mr. Beilby's paper was given in Vol. XLV. of the "JOURNAL," p. 294.

INVERTED INCANDESCENT GAS-BURNERS.

As mentioned in the editorial columns of the "JOURNAL" for the 20th ult., one of the papers in the programme for the first session of the newly-formed Illuminating Engineering Society in New York was on the above-named subject. It was read at the meeting held on the 9th ult., by Mr. VICTOR A. RETTICH. We give below the principal portions.

Opinions seem greatly divided as to the ultimate success of inverted burners; some contending that to burn gas downwards at the ordinary pressure of less than 2 inches is like trying to send water uphill without the requisite force in the pumps. After a long discussion at a recent convention in England, the verdict was that the inverted lamp in its present form would not be a success. At the same time, no suggestions were put forward towards altering the anomalous condition. When the gas is burning downwards at a low potential energy, and all the parts are cool, it is enabled to give kinetic energy to the surrounding still air; but when once the heating process has been started, the air is no longer still, but, being rarefied by the heat, commences to perform its physical function of convection. Therefore, unless the potential energy is sufficiently strong to overcome the upward tendency of the air, it is obvious that the gas must go through without being previously mixed with air, and so "deluminized" by the process of oxidation, cooling, and dilution, consequently burns with a luminous tip. Further, the mantle itself in its present form must cause back-pressure, and so retard the rapid efflux of the mixed air and gas at the burner-head. It seems to me that the knitting of the mantle has not been carefully studied in the manufacture of inverted incandescent lamps. A mantle of thicker cotton, but with interstices of much greater area, should produce one of the same tensile strength as the present, and decrease the back-pressure in the burner while admitting more oxygen to its interior. In a recent paper, I stated that the original incandescent gas-burners had been made with mantles underneath; but in these cases the gas was under pressure, so that the potential energy of the gas could do the necessary work to maintain perfect combustion. Where a light gas of low candle power is supplied at a pressure exceeding 2 inches, the inverted burner will doubtless give good results; but with New York gas of about 23-candle power, with the pressure averaging 12-10ths to 15-10ths, the problem is a very difficult one to solve.

With regard to the progress of inverted burners, an English patent was granted in 1895 to Messrs. Hancock, Craig, and Hancock for one constructed so that no air was admitted to the burner to mix with the gas; the carburetted air, or a combination of air and gas, being supplied to the burners all ready mixed and in proper proportions for burning. Later in the same year, a further patent was taken out in which the burner drew in its own air. As far as I am aware, neither of these burners was ever placed upon the market. It would seem that inventors were trying to imitate an incandescent electric lamp, for on looking over back patents, I find one granted in 1900 to Messrs. Bernt and Cervenka for an inverted burner, and in 1902 another granted to Tresenreuter for a downward appearing lamp—that is, in which the shadow is reduced to a minimum. Each of these patents has the same object in using a heat insulator or isolator between the point of combustion and the gas inlet, and nearer to the ignition-point, with the view of ensuring an intake of cold air. In Tresenreuter's specification, claim is made for preheating the gas. Upon the merits or demerits of this process, it is not my intention in this paper to argue, though I strongly favour the idea of delivering gas and air at the coldest temperature possible.

During a recent visit in Europe, I was told that the sale of the inverted lamp was something enormous. Still I must confess I failed to see that even a small percentage of the burners in use were of the inverted type; and if, under the conditions met with there—with 10 to 14 candle gas delivered at a good pressure—the burners have not been popularized, I cannot see that in their present form they are going to be a permanent addition to gas-lighting appliances. The inverted burner has been on sale in Europe for the last four or five years, and yet to-day a very large majority of burners are of the upward type, fitted with a straight glass chimney, and by means of suitable shades the light is directed exactly where it is required. One must readily admit that the possibility of graceful outlines and designs is greatly extended when the gas is caused to burn downwards; but so far the public have not taken very greatly to the designs in which the mantle is so placed, and the globe so shaped, as to present the appearance of an electric incandescent lamp.

After a long series of experiments, it seems that if, on first lighting, the burners ignite without flashing-back and causing noise, it will only be a short time before they will carbonize the mantle. If, on the other hand, when the burner is so regulated as to give violent ebullition on starting, and in the course of five or ten minutes to become silent, this lamp will, under most conditions, give the best results.

We must, it seems to me, look for much improvement in the method of connecting the mantle to the holder, as experience teaches us that there is a strong inclination for these mantles to

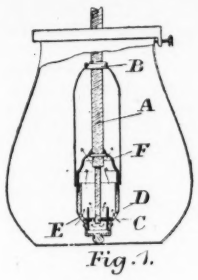


Fig.1.

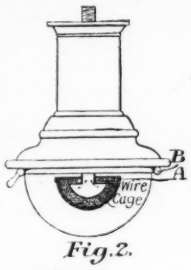


Fig.2.

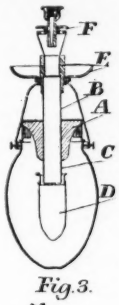


Fig.3.

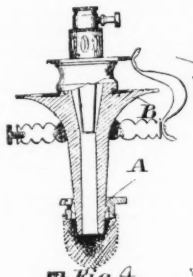


Fig.4.

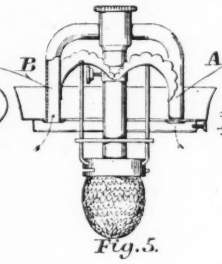


Fig.5.

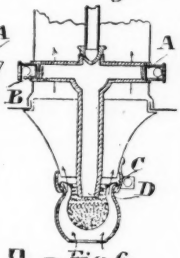


Fig.6.

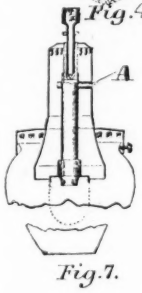


Fig.7.

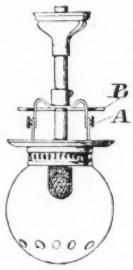


Fig.8.

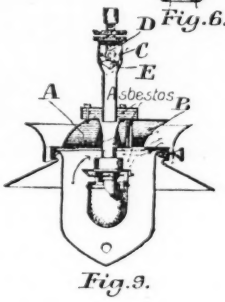


Fig.9.

fall away at the point at which they are fastened. When a mantle is constructed for an upright burner, the head is always strongly reinforced and plaited; but with the inverted burner only a single thickness of the fabric is utilized to support the entire weight. Now, if the inside of the knitting were doubly or trebly folded and sewn together, and then the asbestos thread was tied around the entire double or triple thickness, a much better cushion would be provided at the weakest point. This may reduce the illuminating power slightly; but the loss will be compensated for by the lengthened life of the mantle.

The inverted burner has been recently condemned in New York City by the Board of Fire Underwriters on account of fires having actually started, and many billiard-tables, &c., having been charred, by red-hot carbon falling through the open base of the globe. Of course, the mantle itself will be cold the instant it is broken away from its holding; but red-hot carbon is able to continue to glow long enough to do much damage. Perhaps if the inverted burner can be constructed so perfectly as to avoid carbonization of the mantle, the restriction of the Underwriters may be withdrawn, or they may be satisfied to have the globe without any bottom openings.

To classify the defects and objections to the inverted incandescent gas-lamps, we find the following: (1) Dangers of falling particles. (2) Carbonization of the mantle. (3) Flashing-back. (4) Delicacy of mantle suspension. (5) Flickering light at low pressure. (6) Discoloration of chandelier arms. (7) In many cases a difficulty in attaching lamps so that they will be gas-tight when set in the required direction. (8) Methods of regulating the gas are too coarse; a much more delicate way being required. (9) Liability to break mantles when removing the glass. (10) Variations in the diameters of globe-rings, so that glasses are not interchangeable with different makes of burners. (11) Variations in means of affixing mantles to burners. (12) Too much heat thrown off in proportion to the quantity of gas used.

Varying claims are made as to the efficiency of the inverted burner. While there can be no doubt that the light is vastly greater than the ordinary 16 to 32 candle power electric bulb, still it is so brilliant and glaring that it has to be toned down by ground glass or opaque shades; so that the actual candle power utilized is not to be compared with that obtainable. It is a well-known principle in illumination that strong sources of light should be avoided as much as possible. Therefore this present seeking after high-candle power for inverted gas-burners must eventually resolve itself into placing them higher on the fittings than are the present upright burners, so that they are above the line of vision, or else three or four smaller burners must take the place of one larger one.

When the regenerative gas-lamp was brought out, it was considered a large source of light. This lamp could justly be said to be of the inverted type, inasmuch as the whole of the light was directed downwards, and the flame was beneath the burner. These lamps were generally fitted as near the ceiling as possible, and by means of a suitable reflector an even distribution of light resulted; but the origin of light itself was too far removed from the eye-line to make itself obnoxiously felt. When the miniature regenerative lamps came out for hanging on the chandelier, as we are now doing with inverted lamps, each individual burner did not exceed 10 to 15 candles; and, being of a yellow colour, it did not obtrude itself on the retina of the eye.

I will now show several drawings of various types of burners, some of which are upon the market, so that you may see the trend of inventors' thoughts. Fig. 1 is a drawing from the specification of one of the earlier inventions, granted to Hancock and others. It will be noticed that the gas flows through the tube A, which forms the mantle-support at B. This tube carries the gas downwards to the burner-head, screw-threaded at its lower end C. The gas is then expelled through small openings D in a diaphragm drawing air through the parts E provided for the purpose, and then burning entirely within the mantle at the gauze head F. Fig. 2 shows another form covered by the same patent, and is of the type of the inverted burner we are using to-day. It is interesting to note the primitive methods adopted for suspending the mantle downwards. It was done by means of a wire cage connected to a suitable holder A, permitting the mantle itself to lie within the cage. A very good point in this lamp is the hinged joint B, permitting easy removal of the globe.

The next diagram (fig. 3) may be termed the pioneer of the present series. It is the Austrian one already referred to, and its special novelty is the porcelain cone A. The burner-tube B is claimed to be of bad conducting material, though later on in the specification it is stated that the burner-head C is made of metal. Yet the tube forms part of the head; and if this is of metal, the tube must be of the same material. It therefore makes the specification rather of a contradictory nature, Our later knowledge shows us that the mantle is not of the best shape for inverted lights. A deflector E is provided to keep the products of combustion away from the air ports.

The type of burner shown in fig. 3 has been considerably improved, and is now sold as shown in fig. 4. An adjustable gas-check has been found necessary to suit the varying pressures; and the porcelain cone has been extended both upwards and downwards as at A and B, so that its narrowest point A now becomes the burner-head, and the outwardly flaring part B acts as a light-reflector and heat-diffuser, with the object of keeping the air-inlets as cool as possible.

One of the earliest attempts to put a burner on the market, after the previous one had become known in England and Germany, is shown in fig. 5. As previously explained, when air is heated, it quickly ascends. The inventor took advantage of this fact to collect the air in suitable tubes A and B, and send it to mix with the gas, in place of depending entirely on suction.

Fig. 6 is very interesting. It shows a means of deflecting the heat, and of collecting the air from outside the burner itself as at A and B, and a means of regulating each air-port. But what strikes one most is the ingenious method of attaching the mantle to a small globe D and then connecting the globe to the burner itself. As far as I know, this is the only burner which makes use of a tapering nose-piece to form the burner-head. The next burner (fig. 7) is now on the American market, and presents a similar idea, inasmuch as it takes its air from outside the burner itself as at A. The next burner (fig. 8) has no special merit, but simply has a novel method of detaching the globe by means of thumb-screws at A. It is also provided with a heat-deflecting plate B.

Fig. 9 shows a burner to which apparently much thought has been given in its production. It will be noticed that, by means of asbestos, the entire bunsen portion of the burner is separated and insulated from the lower part. A chamber A is provided over the burner for collecting the heated air. It is then projected through a single opening B so that the chandelier or bracket-arm will not be discoloured by the products of combustion. The method of air-intake seems quite ingenious; for though the air-ports C are themselves always completely open, the burner, on revolving up a screw-threaded tube D provided for the purpose, shuts off the air at E until the correct mixture is obtained, and a lock-nut secures it permanently when the proper position is arrived at. It will also be noticed that the method of supporting the perforated globe is ingenious. It can be used either with or without a shade, and is so arranged that if the latter is used the globe fits inside it, and thumb-screws will support the shade, and, of course, the globe with it.

Fig. 10 (p. 32) shows a novel burner, inasmuch as it permits an outer globe to be used which is entirely closed. The globe A contains a straight chimney B, which, by means of suitable catches C, can be supported entirely free from the outer globe, and air can be taken in between this chimney and the outer globe, as at D, and then sucked in at the bottom of the mantle, as shown by the arrows. Above this are provided two iron chimneys E, contained within a brass casing F. Each of these chimneys is provided with a sloping cover G, which sends the heat forward and away from the central tube—again with the idea of preventing the products of combustion from creeping back to the air-ports.

Fig. 11 shows one of the latest burners to enter the field, and it seems to combine many of the good points shown in its predecessors. The outer globe and the inner globe are usable at will, either together or singly, as shown in a similar way in fig. 9. The intake of air may be above the mantle, as at A, as well as below,

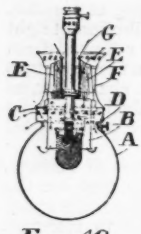


Fig. 10.

Fig. 11.

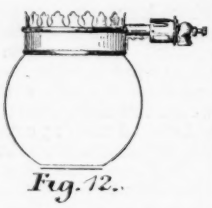


Fig. 12.

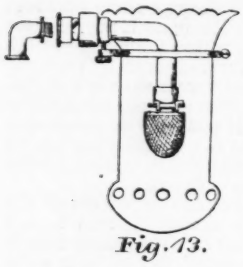


Fig. 13.

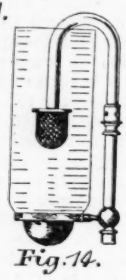


Fig. 14.

Fig. 15.

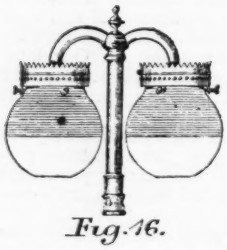


Fig. 16.

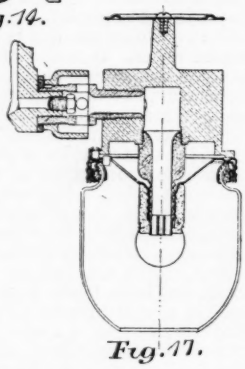


Fig. 17.

so that an entirely closed outer globe may be used, as shown in fig. 10. But in the event of one with an opening being adopted, the bottom of the perforated inner globe is provided with a saucer B at its lower extremity to catch falling particles. The outlet for the heated and consumed air is from one side, as shown in fig. 9. It will be noticed that the adjusting screw is fastened on the side opposite to that by which the heated air is thrown off. A distinct novelty is that of using a thermostat, which is arranged in a direct line with the flow of gas. When the burner is cold, the narrow ends of the thermostat will be bunched together, forming a slotted cone, and offering a resistance to the mixed air and gas, and to so soften the flame as to permit of lighting without flashing-back. As soon as the burner is thoroughly warmed up, the action of the heat on the thermostat fingers will cause them to open and lie flat against the inner surface of the tube; thus offering no obstruction to the descending gas, and permitting it to take in a full supply of air.

All the foregoing inverted burners have been so constructed that the gas is carried to the burner, and then sent at full force in a downward direction. Attempts have been made to pass in the mixed air and gas in a horizontal direction, and then direct it downward, as shown in figs. 12 and 13, and also to send it upwards and then round in a complete horseshoe, as in figs. 14 and 15. The mixture has also been carried up and divided, as shown in fig. 16. With these last-mentioned types of burner, lighting-back is nearly overcome, owing to the speed of the gas being so greatly reduced; but with such a soft flame it requires only a very slight drop of the pressure to cause the mantle to become full of carbon.

Fig. 17 is the type of burner that is used for railway carriage lighting, and one that appears to have given great satisfaction. A peculiarity is the way in which the mantle is attached. It will be noticed that there is no opening between the mantle-holder and the burner-tube—that is to say, the mantle is continuous with the tube, so that no products can escape. Combustion is absolutely perfect, and consequently no carbonization of the mantle follows. But this brings us back to the old question of pressure. The supply of Pintsch gas is at 1 lb., or roughly speaking, 28 inches of water. With gas at this potential energy, and the tiny orifices through which it is forced, the amount of air induced is very great, so that the lighting is of the highest efficiency. Strange as it would appear, the life of mantles used in railway service is remarkably long—from ten to twelve weeks, which is about the life of the electric bulb. Though not clearly shown in the drawing, the mantle carrier and globe are fastened together, and are attached and removable when so joined. In the case of a renewal, the porter of the train unscrews the globe, bringing with it the mantle-holder, and replacing it with another globe containing a fresh mantle quite as easily as an electric bulb is attached. This, I understand, may be done without shutting off the gas supply, as the mantle can be burnt off just as well when gas is inside as otherwise.

We have now examined three separate and distinct types of inverted burners; and it would almost seem that any piece of tube with holes drilled at one end for an air-intake, furnished with a regulating check and means for carrying a mantle and globe, will give a good result in the hands of a person well versed in the art. It will burn for a considerable time, giving satisfaction; but, somehow, as soon as it reaches the public, no matter how carefully the details have been worked out to render it "fool-proof," it is only a matter of a very short time before it is discarded and the upright burner again installed.

In conclusion, I may say with our English brethren that the problem is not yet solved, but, with so many capable engineers all over the world at work on the subject, a good, reliable, and simple lamp must be evolved; and then gas consumers will be provided with a burner that will give at least 60-candle power with a consumption of not more than 3 cubic feet of gas. When the designer of fittings gets in his good work, by constructing them to suit the burner, an enormous field will be opened up, and the public will welcome the advent of an appliance that will give the decorative effect of an electrolier, but with more light and at greatly reduced cost. Gas men must join me in hoping that the day is not far distant.

In the course of the discussion on the paper, Mr. G. G. Ramsdell said he thought that while there was some truth in it, there was also unfortunately a great deal of error. If he had written it, he would have been as optimistic as the author had been pessimistic. He believed the inverted lamp would prove successful; that while it was not yet entirely perfect, when compared with other lights, one must admit that it was only passing through the stages of evolution, as all other lights had done, and that great strides had been made in its improvement. Mr. Rettich (interposing) said he had stated that the present form of lamp was not so successful as could be wished; but he acknowledged that so many capable people—including Mr. Ramsdell himself—were at work on improvements, that a perfect lamp must eventually be evolved. Mr. E. C. Brown expressed his disagreement with Mr. Rettich's statements as to the non-success of inverted gas lamps. He said he had unqualified faith in their future, on account of their remarkable lighting effects; and he considered that the defects complained of by the author were largely matters of detail that would in time be overcome, if they had not been already met in a large measure. Mr. Elliott asked a question as to the actual efficiency of the inverted gas-lamp as a light producer when compared with the ordinary upright burner; and Mr. Rettich replied that the direct rays were about 60-candle power, rising to 110-candle power when a reflector was used, with a consumption of 3 cubic feet of gas. Dr. Sharp remarked that in the case of the mantle lamp the bunsen flame, which in itself gave but little light, but had a high temperature, would produce, by the introduction into it of a suitable mantle of solid oxide, a very brilliant illumination. Nevertheless highly-heated gas gave very little light; and if into the stream of gas was introduced a certain amount of vapour which had the property of radiating light when raised by that temperature, the stream of gases would likewise produce a large amount of light. Here, then, were found two different ways of making otherwise non-luminous streams of gas luminous. They might not be able to say why the mantle had the power of giving out enormous amounts of light, working with a flame of very high temperature—the question being made still more puzzling by the fact that the composition of the mantle was restricted to very narrow limits. Mr. Rettich said that Professor Lewes was his authority for the statement that the temperature of the gas-mantle always exceeded that of the bunsen flame, and he would roughly state that the bunsen flame was 1400° Fahr., and the mantle 1500° Fahr. To this, Dr. Sharp retorted that there was good authority for the statement that the temperature of the bunsen flame, far from being only 1400° Fahr., was certainly nearly 1800° C.

Gas for Lighting and Heating Laboratories.

Early last month, a correspondent of "Nature" asked to be informed as to the best gas-making plants for supplying a laboratory with gas made either from coal or from paraffin oil. The question was answered by Professor Lewes, who said that if he were fitting up a large laboratory, he would put in a small water-gas generator, and inject paraffin oil into the fuel during the period of steaming; fixing the hydrocarbons in the gas produced by passing it through a superheater. He referred the writer of the letter to the paper submitted by Dr. Masumi Chikashigé at the meeting of the London Section of the Society of Chemical Industry on the 5th of February, and given in the "Journal" for the 13th ult. (p. 648), as well as to the discussion upon it, for useful hints as to the fitting up of laboratories with gas for heating purposes where coal gas is not available. He added that if the correspondent should not require enough gas to make a small carburetted water-gas plant successful, and if he could get petrol or benzene, he would probably find carburetted air the cheapest thing to use.

The gross value of the estate of the late Dr. E. H. Perowne, Master of Corpus Christi College, Cambridge, and Chairman of the Cambridge University and Town Water Company, whose death was recorded in the "Journal" for the 13th ult., is £5847.

FIRE, FIRE RISKS, AND FIRE EXTINCTION.

The Spontaneous Ignition of Coal.

At the Society of Arts, on Monday last week, Professor VIVIAN B. LEWES, F.I.C., F.C.S., delivered the third of his series of Cantor Lectures on the subject of fire and its prevention. The first two lectures were noticed in the "JOURNAL" for the 27th ult. (p. 860). In the third, the lecturer dealt at some length with spontaneous ignition, especially of coal.

In his opening remarks, Professor Lewes pointed out that in the storage of inflammable material in bulk dangers which hardly exist with small quantities often become of a serious character; and it is the increase in mass which in most cases leads to those actions which culminate in spontaneous ignition. Substances, especially those of vegetable origin, undergo slow oxidation at temperatures below the ignition-point; and it is only the action being spread over a long interval that prevents our realizing that heat is being evolved. A certain increment of temperature, however, is generally needed to start slow combustion; but when once the required rise takes place and the operation commences, the surrounding mass of material keeps in the heat, the temperature goes up, and the ignition-point is finally reached. Here the lecturer explained that the initial increase may be brought about in several ways—first, by physical action, as in the absorption of a large volume of gas and its compression in the pores of a substance; by a rise in atmospheric temperature; by a direct chemical action taking place at the ordinary temperature; and by the action of ferments on most organic matter. To the first class belongs the spontaneous ignition of a mass of powdered charcoal or lampblack. The lecturer illustrated this by experiments, and then passed on to deal with the spontaneous ignition of coal, on which he made the following remarks.

In the spontaneous ignition of coal stored in bulk in our gas-works, or being carried in large consignments in vessels to distant ports, we find both absorption of oxygen and increase in temperature playing an important part. There is probably no form of spontaneous ignition that has claimed a heavier tax, both in men and money, than that of coal; ships engaged in the carriage of this commodity to ports in the Far East having been specially liable to loss from this cause. Coal, which is the fossil remains of a monster vegetation that grew long before the earth was inhabited by man, may be looked upon as containing much the same constituents as a lightly-burnt charcoal rendered dense by pressure, and richer in hydrocarbons owing to the prevention of the escape of these bodies during its formation, and containing, moreover, not only the inorganic material present in the sap of the original plant, but also mineral matter formed in it by infiltration during the long ages of its production. It may therefore be looked upon as consisting of carbon, hydrocarbons, and inorganic constituents. Among these latter we find iron pyrites, or disulphide of iron, which occurs sometimes as bright golden laminæ in the cleavage of the coal, sometimes as heavy and metallic lumps where it has formed in a cavity, and occasionally in a finely-divided and feathery form spread through portions of the coal itself. If these pyrites are collected from the coal and made into a large heap exposed to air and moisture, they rapidly heat and often inflame, owing to the oxidizing action of the air and moisture upon the sulphur; and it is still believed by many observers that it is this action in the coal itself which gives rise to its spontaneous ignition. The fact is, however, that many coals containing a high percentage of pyrites are perfectly safe, and have never been known to seriously heat or ignite; while other classes of coal, practically free from pyrites, invariably suffer from spontaneous ignition under conditions favourable for its production.

A careful study of the phenomena occurring during the heating of a mass of coal, leads to the conviction that the pyrites present can only play a very subsidiary part, and that it is in reality the absorption of oxygen by the freshly-won coal, and the activity of the condensed gas in contact with the hydrocarbons of the coal, that are the active factors in causing the ignition. In the coal seam, the pores of the coal (for a trace of the original structure still remains in it) are filled with methane, or a mixture of methane and carbon dioxide—gases produced during the actions that led to the formation of the mineral. When this coal is won and brought to bank, it exudes these gases from its surface, and in turn absorbs oxygen from the air. The action, however, cannot go on to any great depth in the coal. All the time the pieces are fairly large, no heat shows itself; but as the coal gets more and more broken by jolting during carriage and shooting into the ship's hold, the surface becomes enormously increased, and the mass of fine coal formed under the tip and below the hatchways in the ship is generally the spot at which heating develops and ignition eventually takes place. The mere absorption of the oxygen, however, is insufficient to bring about serious consequences, unless there is an initial rise in temperature to start the action; and in coal-cargo ships it is found in the heightened air temperature while going through the tropics, in ship's bunkers by contact with the casings near the boilers, and in coal-stores on shore by proximity to a steam-pipe or a flue—it being found in every case that the spontaneous ignition of the coal started at the point where the cause of the initial rise of temperature was to be found.

The old idea as to the treatment of coal to prevent spontaneous ignition, was to provide ventilation; and this would be perfectly effective if the free flow of air through the mass of coal could be obtained. But this is impossible in a cargo on board ship, and difficult even in a coal-store; the result generally being to supply just enough air to lead to dangerous heating. Well-authenticated cases are not rare of ventilated ships being lost; while vessels laden with the same coal, the cargo having been simply battened down, have reached their destination safely. Moisture is a very powerful agent in aiding chemical action; and, as is well known, many forms of combination—such as the burning of carbon monoxide in oxygen, and even the combination of phosphorus with oxygen—are prevented if both the reacting substances are perfectly dry. In the same way, the action of the occluded oxygen in the coal is enormously aided by the presence of moisture; so that heavy rain while a coal cargo is being taken on board or stored, generally results in heating, and often active danger.

The latest suggestion for the prevention of spontaneous ignition of coal is to wet the cargo or the mass in store; and as long as the coal is practically kept wet with water this no doubt would be effectual. In practice, however, I conceive no more dangerous suggestion, as a shipowner has no desire to limit the carrying capacity of his vessel by taking in a large quantity of water. Consequently, he would merely moisten the coal to a degree that would accentuate—not lessen the danger; while if it were attempted to wet only the portion below the hatchways, where heating and ignition generally show themselves in a most marked way, a few days under hatches would suffice to cause the evaporation of the water from this spot, and its fairly equal distribution throughout the whole cargo, giving the most favourable conditions for serious heating. In coal-stores on land, the action of weathering is perfectly well recognized; and it is well known by gas managers that in coal which has been stored for a long period loss in hydrocarbons takes place, which shows itself in either diminished volume or decreased luminosity in the gas produced from long exposed coal. In this case, as in all others, mass plays a very important part, as may be seen from statistics with regard to cases of ignition of coal cargoes shipped to Eastern ports. With 500 tons of coal to the cargo, the cases of spontaneous combustion amount to only about 0·25 per cent.; while, when the bulk is increased to 2000 tons, the number rises to 9 per cent. In order to prevent the spontaneous ignition of large masses of coal, the most important precaution to take is to prevent as far as possible breakage during storage, as the exposure of fresh surfaces of coal just at the time when it is being put under conditions in which the heat generated by the action of the oxygen cannot escape, is one of the chief factors that generally lead to the danger. The breaking-up of the coal which has taken place in the earlier stages of its career has probably had time to complete this action and get rid of the heat to the air; while in the store itself, the greatest care must be exercised in order that no flue, drain, or steam pipe that can give rise to an increase in temperature is anywhere near the store.

Before leaving the subject of the spontaneous ignition of coal, it might be well to deal with the question of the treatment of coal fires on board ship, which is just one of those cases in which the means we generally adopt for extinguishing a fire are practically inadmissible. Given a mass of coal in the hold with a pocket of incandescent coal near the bottom, the difficulty at the outset is to get at it, and the first impulse is to pump water in, and let it find its way to the seat of the combustion. The water, however, cannot get freely to it in quantity, having to filter its way down through the interstices of the coal, meeting as it does so the hot products of combustion, and being evaporated off in cooling these down. The portion that does reach the seat of the combustion, on coming in contact with the red-hot mass of carbon, is largely converted into water gas—a mixture of carbon monoxide and hydrogen—which only requires a small proportion of air to convert it into a highly explosive mixture; and this, collecting under the decks, explodes, ripping up the deck, and blowing off the hatches. This lets in free access of air to carry on the combustion, and generally leads to the total loss of the ship. In order to obviate this danger, steam has been frequently used. But it is even more difficult to get steam to the required spot; and steam, like water, is decomposed into water gas by incandescent carbon. The cooling action that steam has upon the burning mass is far less than would be the case with water, the chief value of which as an extinguishing agent is the large amount of heat rendered latent during its vaporization.

There are certain gases, however, which have a great power of stopping combustion by keeping away the oxygen of the air from the burning substance; and some of these have been proposed for the extinction of such fires. If we burn sulphur in oxygen, sulphur dioxide, with its choking smell, is generated; and this gas has a powerful effect in preventing and extinguishing fire, a small percentage of it being sufficient to extinguish flame. The action of it, however, is purely extinctive and in no way cooling; and with a cargo on fire, the cooling down of the mass is every whit as important as the extinction of the active combustion. Another gas which acts in precisely the same way is carbon dioxide. But here again, if carbon dioxide be merely generated and pumped into the area containing the burning matter, no absolute cooling is effected; and though the use of these gases was suggested more than thirty years ago, it was this trouble which prevented their adoption.

Fourteen years since, I pointed out in this room that, with a proper arrangement of apparatus, carbon dioxide could be made not only a most valuable extinctive agent, but also one of the most powerful cooling materials one could obtain. When this gas is compressed under a pressure of 36 atmospheres at a temperature of 0° C. (32° Fahr.), it is condensed to the liquid state, and can be stored in steel vessels closed with screw-valves. On opening the valve, some of the liquid is ejected into the air; and, being reduced to the ordinary atmospheric pressure, it is almost instantaneously converted into a large volume of gas. Conversion from the liquid to the gaseous state means absorption of a large amount of heat; and so great is this, that everything near the stream of new-born gas is cooled down, and some of the escaping liquid is frozen to a solid, having a temperature of – 78° C. (– 108·4° Fahr.). In applying it to coal cargoes, I suggested that small cylinders of carbon dioxide should be taken, and the nozzle attached to the screw-valve on the bottle should have a short metal nose-piece screwed on to it, the tube of which should be cast solid with an alloy of lead, tin, bismuth, and cadium, which can be so made as to melt exactly at 93° C. (200° Fahr.). The valve should then be opened, and the steel bottle buried in the coal during the process of loading. The temperature at which the fusible metal plug would melt would be well above the temperature that could be reached by any legitimate cause, and would mean that active heating was going on in the coal. Under these conditions, the pressure in the steel cylinder would have reached something like 1700 lbs.; and the moment the plug melted, the whole contents of the bottle would be blown out of it into the surrounding coal, producing a large zone of intense cold, and cooling down the surrounding mass to a comparatively low temperature. The action, however, would not stop here, as the cold, heavy gas would remain in contact with the coal; diffusion taking place but slowly through the small exit-pipe. When the coal has absorbed as much oxygen as it can, it still retains the power of absorbing a considerable volume of carbon dioxide. When coal has heated and then been rapidly quenched, the amount of gas so absorbed is very large indeed; and the inert gas taken up remains in the pores of the coal, and prevents any further tendency to heating. Indeed, a coal which has once heated, if only to a slight degree, and has then cooled down, is perfectly harmless, and will not heat a second time. It is possible to condense 100 cubic feet of the gas in the liquid state in a steel cylinder 1 foot long and 3 inches in diameter; and a ton of coal contains air spaces equal to about 12 cubic feet. Consequently, one of these cylinders would have to be put in for every 8 tons of coal; and they should be distributed evenly throughout the cargo, and near to alarm thermostats set to ring in the captain's room a degree or two below the point at which the fusible plug would melt. The ringing of the bell would give warning that heating was taking place, and the bell would continue to ring until the cylinder had discharged its contents, and had cooled the cargo down to a safe degree. The whole arrangement, therefore, would be purely automatic, and yet the officers would know if everything were safe. If the precautions advocated were taken, no danger could arise until the arrival of the ship at her destination; and the commonest precautions would then suffice. Several firms have adopted the idea, both for the protection of coal cargoes and for stores containing such goods as cotton, jute, or wool in bales, in which it would be extremely difficult to get at the fire by any other means. In most of these cases the cylinders are arranged externally to the store, and the gas is only turned on when a fire is discovered. It must be remembered that with the use of sulphur dioxide instead of carbon dioxide the same cooling effect would never be attained; and that the gas is so irrespirable that 4 parts in 10,000 render air incapable of being breathed; while with carbon dioxide, though 3 to 4 per cent. will extinguish flame, a man can breathe for some time without danger an atmosphere containing upwards of 10 per cent.

Professor Lewes went on to say that the spontaneous ignition of oily waste or other fabric, which is one of the most prolific causes of mill fires if proper precautions are not taken, furnishes an excellent example of chemical action at ordinary temperatures supplying the necessary initial heat to start a more rapid action. When oil in a fine state of division is spread over such non-conducting materials as cotton, or other fabrics of a similar character, it only needs a few pounds of such materials to be allowed to collect in a heap for ignition to follow in a comparatively short space of time. Jute offers the same dangers as cotton when in bulk and oiled. The use of petrol, or petroleum spirit, in large quantities for motors, and the necessity for storing it in bulk, have of late given rise to a danger which before only existed to a limited extent. The temperature needed for the ignition of explosive mixtures of petroleum vapour and air is comparatively high; and experiments made by Colonel Majendie, Sir Boverton Redwood, and Dr. Dupré showed that such mixtures would not ignite by the glowing sparks on a splint of wood or a red-hot coal which had ceased to flare, but that it needed a temperature of platinum wire raised nearly to a white heat—*i.e.*, about 1400°C. (2550° Fahr.)—before explosion took place. In all confined spaces used for the storage of crude oils containing highly volatile constituents, the adoption of the safety lamp and the constant testing of the atmosphere by the methods devised by Dr. Clowes and Sir Boverton Redwood would, the lecturer said, go far towards ensuring safety. When petroleum spirit has once caught fire, it is most difficult to deal with, as, being far lighter than water, it rises to the surface and continues burning, even when great volumes of water are poured upon the fire; while the vapour given off prevents any cooling of the liquid proving efficacious. Chemical extinguishers and gases like carbon dioxide and sulphur dioxide can only act upon it if the fire is in a very confined space, as the up-draught caused by the fierce flame sweeps them away, and sucks in air to the burning mass. Sand or fine mould is the best thing to extinguish a petrol fire; and if this is not at hand in sufficient quantity, the fire should be allowed to burn itself out, and the whole attention of the firemen directed to protecting the surrounding property.

The concluding portion of this interesting lecture was devoted to a consideration of the fire risks arising from combustible dust, collodion, and materials containing loosely-held oxygen. The lecturer pointed out that in the mixed storage of various substances many unexpected troubles arise; and he laid stress upon the necessity for the possession of a considerable amount of chemical knowledge on the part of storekeepers, to enable them to gauge whether or not danger lurks in the simplest bottles or packages, as, should fracture or bursting liberate some of the contents and bring about their admixture, many unexpected phenomena would be developed.

In last night's lecture—the concluding one of the series—Professor Lewes dealt with the prevention and extinction of fire.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Notes on Carburetted Water Gas.

At the March Meeting of the Association—which was held on Friday, at the Regent Street Polytechnic, under the presidency of Mr. Walter Grafton—a paper entitled "Notes on Carburetted Water Gas" was read by Mr. H. J. CARPENTER, of Harrow.

After pointing out that carburetted water gas was used on most gas-works to augment the coal-gas plant, but in some cases as a means of enrichment, the author briefly described (with the aid of drawings) the two designs of the Lowe type of plant—that is, the double superheater, in which the carburettor and superheater are separate vessels, and the Merrifield-Westcott-Pearson setting, which combines the carburettor and superheater in one shell. His subsequent remarks referred more particularly to the double superheater form, as made by Messrs. Samuel Cutler and Sons. An essential point in gas-making was, he said, to keep up a good pressure of steam—never less than 95 lbs. per square inch at the generator. Low-pressure steam decreased the make and damped the generator. The quantity of steam admitted also required attention; the loss through insufficient steam being considerable. On the other hand, too much steam would cause an excess of carbonic acid in the gas, which would materially reduce the illuminating power. The steam-regulating valve should be opened as wide as possible without exceeding the ascertained maximum of carbonic acid.

With reference to carbonic acid, he mentioned a simple apparatus made by Messrs. James Milne and Son for ascertaining approximately the percentage of carbonic acid with the minimum of trouble.* The arrangement, he explained, consisted of a small pump of certain capacity, a measuring glass, and a standard solution of lime water. When a test was to be made, the inlet end of the pump was connected by means of a rubber tube to the gas supply to be tested; and after clearing all the air out of the pump by passing gas through, the nozzle of the pump was placed in the measuring glass, which was half filled with lime water, to a mark on the glass. The pump was then worked; the operator being careful to make a full stroke each time, and the plunger being brought back by a spring. When the lime water was sufficiently turbid to prevent the nozzle, when placed in the centre of the glass, from being seen from the outside, the pumping was stopped. The number of strokes, divided into 200, would give the percentage of carbonic acid in the gas. The results obtained were reported to be within 5 per cent. of those secured with Orsat's apparatus.

Returning to the water-gas plant, the author said the fuel in the generator should be kept at a sufficient height—level with the underside of the top gas-outlet. Otherwise some of the carbonic acid formed in the lower part of the generator would pass forward unreduced to carbonic oxide, and lower the illuminating power of the gas. In order to prevent the fire getting dead in the bottom of the generator, up-to-date plants were provided with means for passing the steam either up or down through the generator when gas making. The coke used should be in a fairly dry

* See "JOURNAL," Vol. LXXXIX., p. 642.

condition. The use of over-quenched coke, or coke that had been standing in the wet, would lower the temperature of the generator and increase the carbonic acid in the gas. Care should be taken to avoid any loss of the carburetting oil. The oil-sprayer in the carburettor should be regularly examined and cleaned; for if the holes got stopped up bad spraying would result, or if they became enlarged some of the oil would remain in a liquid state in the carburettor, and be burnt off in the subsequent blow. With most plants the oil was heated before entering the sprayer. The take-off pipes should be cleaned—say, every six weeks when working a twelve-hour day, as when high heats were used lampblack would be formed, which would block the free way for the gas and affect the make, as some gas would remain in the plant and be driven off at the stack-pipe the following blow.

When starting a set, the heats should be raised gradually, as undue haste might affect the fire-brick linings. The maintenance of regular heats was important; insufficient heat causing a decrease in the make and an increase of tar in the gas, while too great heat would cause a deposition of lampblack in the carburettor and superheater and impair their efficiency. The temperature in each vessel was ascertained by noting the colours through a series of sight-cocks fitted to the various vessels; but the knowledge of the relation of the colours to temperature could only be attained by experience. The condenser should be maintained at a constant temperature—say, about 50°. If this were allowed to fall too low, it would affect the illuminating power of the gas. The author exhibited a model of Messrs. Cutler and Sons' interlocking gear, by means of which the action of turning on the steam automatically locked the rods which opened the blast valve—rendering it impossible to have steam and blast on at the same time. Thus any chance of explosion from this cause was prevented, and the work of the operator was simplified. It was a wise plan to have a gas-jet on the operating stage, so that the quality of the gas passing from the plant could be approximately judged. The belts from the engines to the blowers should be carefully noticed, to prevent them becoming slack and thus permitting slip, and so cause the pressure of the blast to decrease. Direct engine-coupled blowers were now much in vogue—in some cases steam-turbines being used. After remarking that the practice of superheating the steam supply to the generator did not seem to have been generally adopted for carburetted water-gas plants, though the steam superheater was in use for blue water-gas apparatus, the author drew attention to the combined oil-vaporizer and steam superheater made by the Economical Gas Apparatus Construction Company, Limited, in connection with their plant.

Mr. Carpenter concluded his paper by remarking that the advantages of a carburetted water-gas plant, put briefly, were as follows: (1) The ease with which it could be started. If at any time there was a sudden demand for gas with which the coal-gas plant could not cope, a water-gas set could be lighted up and started, at a pinch, in four hours. (2) In districts where coke was at a discount, those works which possessed a plant became their own consumers, relieved the market, and maintained the price. (3) From the labour point of view, it had advantages; the duties of the operator being light and easily learnt—thus rendering the manager independent of skilled labour. Then in some cases carburetted water gas destroyed and prevented naphthalene deposits; but in others it had the opposite effect. He had had no experience with regard to the manufacture of blue gas, and did not know what advantages it possessed; but it would be interesting to have from some member information on this important point, as the gas was made on several works, and appeared to give very satisfactory results.

The discussion was opened by Mr. Upton, who suggested that, in any future papers on the subject, some particulars should be given with regard to cost. This was a vital point in connection with any system. He would like to know whether there was any advantage in one plant over another. For instance, in the Merrifield-Pearson pattern, where the carburettor and superheater were one, a higher building was necessary than for plant in which the carburettor and superheater were separate. But, on the other hand, the latter took up a little more ground-space. There the question of cost came in—ground area *versus* height of building. He knew that in some cases tar had been used in the place of oil; and perhaps some member would be able to give particulars of this. Then he would like to know whether the oil had any action on the brickwork of the carburettor. The question of whether carburetted water gas or coal gas should be supplied, was entirely a matter of the cost of the two gases; and this must generally be governed by the prices to be obtained for residuals in the local market. Mr. Scarth said he gathered that carburetted water gas was generally used as an enricher. Could anyone give them any information of its being employed as a diluent? The present tendency was to supply low-grade gas; and unless carburetted water gas could be made cheaper than coal gas, it was not likely to stay. He agreed with the ease of getting a set to work; and he knew of several companies who had during the recent cold weather found their carburetted water-gas plant a great boon. Mr. S. A. Carpenter remarked that he thought carburetted water gas had a somewhat unfortunate name. Consumers reasoned that water was very cheap; and if water gas was made, they should pay much less for their gas. As to cost, it was, of course, difficult to get exact figures, because it depended upon so many local conditions. The price of coke could be raised through a water-gas plant; and this went to the credit of it. One very considerable drawback was the variation in specific gravity which took place in the mixture over the district when changing percentages of water gas were sent out. This gave trouble with incandescent burners and fires, causing roaring and necessitating constant attention. But when water gas in admixture with coal gas was used for fuel, the larger percentage of carbon monoxide was not an obstacle. He considered there was a great future for blue water gas for heating. He believed several of the members had had experience of blue water gas which was afterwards carburetted; and some information would be interesting. The question had often struck him whether the resultant gas was so permanent when blue water gas was carburetted as was ordinary carburetted water gas where the oil was thoroughly cracked up. Mr. Gale asked whether the author could give any further information as to his statement that in some instances carburetted water gas decreased, and in others increased, the naphthalene deposits. Mr. Dean remarked that there were one or two points on which he would like to state his experience. It was a most important thing to have sufficient condensing power, so as to reduce the temperature of the gas as far as possible before it went to the purifiers. He had found that water gas, after travelling a quarter of a mile to the relief holder, had deposited 70 gallons of tar and water per million cubic feet. Another point was that he had discovered at times that coke from Durham coal was better for carburetted water-gas manufacture than that from Yorkshire coal. The only drawback was that it had so large a percentage of ash that the clinker might give a little trouble. At present, there seemed to be a fairly good market for carburetted water-gas tar; he believed it was fetching as much as coal-gas tar. Respecting the bricks at the top of the carburettor that were subjected to the oil vapours, when these were removed they were replaced with others that had been in the superheater previously.

The President pointed out that, in the matter of steam, the author fixed 95 lbs. as being the economical limit; but he himself thought that between 100 and 120 lbs. was better. With regard to carbonic acid and lime water, he did not think this was at all a reliable test. Barium hydrate was more sensitive; but he much preferred potash. Could the author give them the weight of fuel used in the generator per 1000 cubic feet of gas made? Certain heats tended to produce tar; and if they were not all that they should be, lampblack was formed. He thought they were going to be told some ready means whereby they could avoid both the tar and the lampblack. He did not see why carburetted water gas should prevent the formation of naphthalene in one place and assist it in another. As to using a water-gas plant as a diluent of coal gas, he did not see the object of this, unless it was impossible to make gas of the parliamentary standard without it. If one was supplying 14-candle gas, and the coals would only yield 16-candle gas, he could see the policy of it; but not otherwise. He could not see how bricks were going to absorb oil to such an extent as to be detrimental to the plant. If they did so, he thought there was some fault in the spraying of the oil. The object, of course, was to get the oil to go in as a mist—more as a vapour. It would then make carburetted water gas without being absorbed by the bricks. In conclusion, he would like to ask what was the real effect of carbonic acid on the candle power of the gas. This was often greatly exaggerated.

Mr. Carpenter, replying to the questions that had been put, said he had only had experience with Cutlers' system, and so he could not make any comparisons of the advantages of that and other plants. They had never tried using tar in place of oil. They renewed the carburettor brickwork when they changed from one set to the other—that was, about every six months. As to the cost of coal and water gas at Harrow, there was really not much difference; at some works he believed there was a considerable margin. But there were very much greater advantages attending the use of carburetted water gas than any saving in cost. Besides this, the capital charges for such a plant would be, he should think, about half as much as for ordinary coal-gas plant. Mr. Scarth had asked whether they used water gas as an enricher at Harrow. Really they employed it as an auxiliary. Their average quality was about 17 candles. This would be slightly higher than the coal gas; but they could not say they used it as an enricher. He had never had any experience of using water gas as a diluent. He really did not know of any works where water gas had caused naphthalene; but he had heard the fact stated. As to steam, he thought 95 lbs. was about the minimum; but there was probably no objection to raising it. He had read in a text-book that every 1 per cent. of carbonic acid lowered the candle power of the gas 4 per cent.; but he had not tested this assertion to see if it was correct or not. He could not from memory state exactly the amount of oil and coke used per 1000 cubic feet.

The President pointed out that if they took a certain proportion of coal gas and added a certain proportion of carburetted water gas, the value of the two would not really work out according to arithmetic. It would be found that there was rather a benefit by mixing. He was assuming, of course, that there was no excess of carbonic acid.

A hearty vote of thanks was accorded to Mr. Carpenter for his paper, on the proposition of the President, seconded by Mr. Upton.

ANNUAL MEETING OF THE MIDLAND JUNIOR GAS ENGINEERING ASSOCIATION.

The Annual General Meeting of the Association was held at the Birmingham Technical School on Saturday, under the presidency of Mr. F. J. Bywater. The business consisted of the consideration of the report and balance-sheet, the election of office-bearers for the ensuing year, and a paper by Mr. Leslie Wilson, of Stafford, entitled "Notes on the Working of Retort-House Governors."

The Report and Balance-Sheet.

The Hon. Secretary (Mr. J. Hewett) read the report of the Council and balance-sheet. The former, after referring to the circumstances under which the Association was formed last July, stated that the present membership was 110, and expressed the opinion that the first year's existence had been a very successful one. The average attendance at the meetings had been about 55, which was very good, considering the large area covered by the Association. The statement and accounts showed a present balance in hand of over £19; but it was estimated that this sum would be reduced to about £7 after payment of the difference between the actual cost of printing and distributing the Transactions and the amount that would be realized from the sale of same. The price of the Transactions has been fixed at 2s. 6d. per copy in paper cover, and 3s. 6d. bound in cloth; but each member will be entitled to one copy at a nominal charge of 1s. or 1s. 6d. respectively. In conclusion, the Council drew attention to the fact that the Midland Association had adopted a resolution at their last meeting, that the President and the Hon. Secretary for the time being of the Junior Association should be ex-officio members of Council; and they remarked that this still further strengthened the bond between the two Associations.

The President said that, before the adoption of the report and balance-sheet was moved, there were one or two matters which called for some remark. The thing that would strike them most was the satisfactory character of the first balance-sheet, which reflected the greatest credit on the Hon. Secretary. He thought that the report also would be considered satisfactory. The papers submitted had been favourably commented upon outside the Association; and altogether his idea was that the first year had been a very successful one. If there was any fault to be found at all, he hoped that next session there would be even better discussion of the papers. The printing of the papers beforehand was impracticable on the ground of expense; but perhaps a very full synopsis of them might be given when sending out notices of meetings. This would give the members an idea of the subjects to be dealt with, and so enable them to look the matter up and prepare points for discussion. After commenting upon some points of the report, he said there was one subject to which he had alluded at the previous meeting, and to which he would again refer. This was the bond that had been formed between them and the much honoured parent Association, by making the Hon. Secretary and President of the Junior Association members of the Council of the Senior Association. He had no doubt that this would prove of even greater benefit than was apparent at the present time.

Mr. A. O. Jones (West Bromwich) then proposed the adoption of the report. He agreed that both this and the balance-sheet were of a most gratifying character, and suggested that the Council and Secretary were deserving of a hearty vote of thanks for the excellent way the work had been carried out.

Mr. C. M'Pherson (Nechells), who seconded the motion, supported Mr. Jones in the remarks he had made, and said it was most encouraging to them as juniors to have received so much consideration from the Senior Association. Possibly in the future the Midland Association might see their way to allow the juniors an opportunity to attend some of their meetings—though not, perhaps, to take part in any of the business. The labours of the first session entailed on the Secretary above all an immense amount of work; and Mr. Hewett had not spared himself. The Association were much indebted to him.

Mr. T. Berridge (Leamington) said that before the resolution was put, he would like to take the opportunity of supporting it. He most heartily congratulated the members on the great success they had made of the Association. The work had been carried out in a most energetic manner; and the papers that had been read would not have disgraced any of the Senior Associations. The President also deserved hearty congratulation on his excellent address, and the Secretary on the energetic work he had put in. The report referred to the part that he (Mr. Berridge) took in the formation of the Association; but he would like to see Mr. Meiklejohn's name with it. Mr. Meiklejohn went to a great deal of trouble in connection with the matter. With reference to what had just been suggested—that the juniors should be permitted to attend the meetings of the Senior Association—he could see very grave difficulties in the way. He very seldom left his town at the same time that his assistant was away; and if the assistant was admitted to the meetings of the Senior Association, he (Mr. Berridge) would not like to feel that he was keeping him at home, and was depriving him of privileges which other juniors enjoyed. The result would be that he would not be able to attend the meetings himself. In fact, some of the meetings of the Junior Association—and they came very frequently—had compelled him to stay at home on a Saturday afternoon, so as to allow his assistant to attend. This brought him to another point. While they had had a splendid lot of papers during the past session, the question arose whether they were not going rather too rapidly; and he thought they might find it better to have fewer meetings in the twelve months. It did not do to exhaust all the good men straight away; they wanted to keep a little bit in reserve. He hoped the Association would have a summer meeting, and that they would select Leamington for it. They would have a very cordial welcome; and though they might not see anything very new, they would see a useful, up-to-date, without-too-much-capital-expenditure works, and a beautiful town. He could assure them that the members of the Senior Association were very gratified indeed that such a success had been made of the Junior Association, and hoped that they would go on and prosper.

The President said the question of having fewer meetings had been discussed by the Council; and now it might be well to have an expression of opinion from the members as to the advisability of having one visit or one paper a month, instead of sometimes two. He thought next year they would have a fair number of good papers; but they must look on some years ahead.

Mr. H. Burgess (Derby) said that he personally had facilities for attending the meetings; but there were other people to consider as well. He thought it could be left to the Council to arrange as they might see fit.

The President remarked that as there did not seem to be any great expression of opinion on the subject, it might perhaps be left to the Council to decide, when the Secretary had prepared his report on the papers to be read next session.

The report was then adopted, with the addition of Mr. Meiklejohn's name in connection with the formation of the Association.

Election of Officers.

The following is a list of the officers for next session.

President: Mr. G. W. G. Tatam (Saltley). *Vice-Presidents:* Mr. W. E. Caton (Derby), and Mr. S. T. Smith (Walsall). *Hon. Secretary and Treasurer:* Mr. J. Hewett (Saltley). *New Members of Council:* Mr. A. O. Jones (West Bromwich), Mr. C. M'Pherson (Nechells), and Mr. A. H. Cranmer (Wolverhampton). *Auditor:* Mr. R. J. Meiklejohn (Rugby).

Mr. Tatam, in returning thanks for his election as President, referred to the valuable work that had been done during the past session by Mr. Bywater and Mr. Hewett, on whom most of the labour had fallen. He asked the members to accord these gentlemen a very hearty vote of thanks—to Mr. Bywater for the able way in which he had occupied the chair, and to Mr. Hewett for the energy and time he had devoted to the work of the Association. He would also like to include the names of Mr. Berridge and Mr. Meiklejohn, to whom their gratitude was due for the starting of the Association. They were all in agreement that the meetings had been most successful in every way, but especially from an educational point of view. The papers had all been thoroughly beneficial to the members; and they practically owed all this to the forethought of the two gentlemen he had named—Mr. Berridge and Mr. Meiklejohn.

Mr. Smith, after returning thanks for his election as Junior Vice-President, said he had great pleasure in seconding the vote of thanks proposed by Mr. Tatam. Mr. Bywater and Mr. Hewett had done a tremendous amount of work; and certainly their thanks were also due to the ex-President and Hon. Secretary of the Senior Association for the way in which they had brought the Junior Association forward. It had been a great help to the members of the latter body to have a place where they could meet together and discuss matters and hear papers read on subjects with which they were intimately connected. The only regret he had—and the President had already referred to the matter—was that the various discussions had not been greater. He hoped that next session the members would try to bring this part of the proceedings to a more useful point.

The vote having been accorded by acclamation,

The President, the Secretary, and Mr. Berridge all briefly acknowledged the compliment.

Notes on Retort-House Governors.

Mr. Leslie Wilson (Stafford) then read his paper on "Retort-House Governors," and this, together with a report of the discussion to which it gave rise, will be found on the opposite page.

The death took place recently at Mentone, at the age of 77, of Carl Heinrich von Siemens. He was born at Menzendorf, in Mecklenburg, and was the sixth son in a family of eleven sons and three daughters. For the greater part of his life he co-operated with his brothers Ernst Werner, William, and Friedrich, and with the first-named two he was instrumental in the development of the firms of Siemens Bros. and Siemens and Halske, and of the various undertakings with which the name of Siemens is associated. As an inventor his name is not so well known as those of his brothers; but he was a man of great energy and perseverance, and made a name as a capable administrator and organizer.

WORKING OF RETORT-HOUSE GOVERNORS.

By Leslie Wilson, of Stafford.

[A Paper read before the Midland Junior Gas Engineering Association.]

In an ordinary gas-works retort-house, the conditions of working inside the hydraulic main have an enormous influence on the quantity and quality of gas and bye-products yielded, due chiefly to the effect of such conditions on that which takes place in the retort. The function of the retort-house governor, as it is usually employed, is to maintain, in the hydraulic main, more constant and unvarying conditions than can be obtained by the use of any ordinary type of exhauster governor. The retort-house governor is usually mounted on the foul main as close as possible to the retort-bench, and should respond to any increase or decrease of suction on the exhauster side or to fluctuations in the gas production on its inlet. The use of these instruments, therefore, should result in unvarying suction of any required degree, or, if desired, atmospheric pressure in the hydraulic main conditional on a high state of suction between the exhauster and the retort-house governor, thus rendering it feasible to reduce to a minimum, or even dispense altogether with, the seal. In no case can any pressure in the hydraulic main be desirable. By the use of these governors all the advantages associated with anti-dip contrivances can be realized, and without the objections to which nearly all such are open.

It is impossible, under ordinary conditions, to keep constant the amount of suction thrown by the exhauster. This is always subject to temporary variations, due either to changes in pressure of the steam supply to the engine, or to fluctuations in the make of gas; the exhauster governor not being sensitive enough to immediately neutralize these variations. With a retort-house governor working properly, a gauge-glass connected to the hydraulic main will show very little or no effect when a retort lid or lids are closed after charging; whereas under ordinary conditions, with the best of exhauster engine governors, a temporary decrease in the amount of suction is certain to occur during the time necessary for the bell to rise and the engine to gather speed. The majority of exhauster governors are not sensitive enough to prevent oscillation, temporary pressure, or excessive suction in the hydraulic main; and whenever any of these occur, a prejudicial effect on the yield or quality of the gas is bound to be exercised.

The retort-house governor, in addition to counteracting increase or decrease of suction or pressure, greatly minimizes in the hydraulic main and retort that constant rising and falling in the amount of suction which is found on the inlet of all exhausters of ordinary type, and due to the revolving blades of same. It is interesting to note that this oscillation is intensified by a hydraulic seal; but in the case of a retort-house governor, working with absence of seal, such oscillation is practically non-existent in the retort.

It may be worth while to emphasize briefly the importance of constantly maintaining as nearly as possible atmospheric pressure in the retorts, and the desirability of working with a minimum of hydraulic seal; and also to review the chief advantages derivable from such conditions of working. It is, of course, well known that either pressure or suction in a retort is objectionable. Pressure is bad, because if the retorts are unsound gas is lost through cracks, &c.; some of the richest of the gas being lost in this way during the first stages of carbonization, when pressure is likely to be heaviest. Undue pressure in a retort is likely to result also in excessive baking of the gas, which means decomposition of ammonia, and some of the most valuable of the hydrocarbons—valuable on account of their light and heat giving properties, and also as solvents of naphthalene—with the formation of hydrocarbons of a different nature, including naphthalene, and with the consequent deposition of scurf. Another source of trouble arising from excessive pressure in retorts is that of choked ascension-pipes—an evil which is the cause of still greater pressure in the retorts, and losses due to slacking of lids. Overpulling—that is to say, working with a lighter seal on the dip-pipes than the amount of pull in the hydraulic main—might very likely have a beneficial effect in the case of newly-charged retorts, as it would tend to relieve the pressure in same. But it involves, of course, the sucking into the hydraulic main of air and furnace gases; air where a retort-lid is open and through possible leaks in the ironwork, and furnace gases through holes in the retorts, during distillation.

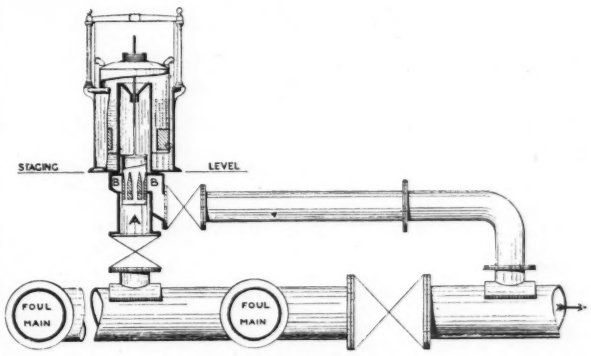
Presumably the ideal conditions for carbonization are constant atmospheric pressure, or very slightly over, in all retorts and at all stages of distillation. This would appear to be best achieved by so regulating the pull on the hydraulic main and the seal in same that no suction is exerted on retorts in which the charge has practically ceased to give off gas, and, at the same time, the minimum of pressure thrown on newly-charged retorts. The amount of this pressure will depend on the area in ascension-pipes; but if this is sufficient, the pressure, even in newly-charged retorts, should be very little (if any) above that of the atmosphere. To maintain such conditions constant and unvarying may be said to be impossible, without more sensitive means of governing than is provided by most exhauster-engine governors.

Now, with regard to the depth of seal; it is generally admitted that the less this is the better. Oscillation is always experienced with a hydraulic seal; and the amount of such oscillation is much aggravated with increasing depth. A seal of several inches would, undoubtedly, induce oscillation to such an extent as to cause alternate heavy pressure and suction in retorts; and a light seal results in but a minimized form of this evil. Another objection to a heavy seal may be illustrated by a quotation from "Newbigging's Handbook."

The hydrocarbons contribute largely to the illuminating power of the gas, and it is therefore desirable to retain them in the permanently gaseous form. Some of them, especially such as are of the greatest density, are reduced to the liquid state by the mere mechanical reduction of their temperature; whilst others of equal specific gravity, and many of those of lower density, undergo a change from the gaseous to the liquid condition by reason of the solvent or absorbent action of the liquid contents of the hydraulic main, through which, by reason of the dip, they have to pass, or with which, in the absence of the dip, they come intimately in contact.

It seems only reasonable to suppose that the absorbent action of the liquid on the hydrocarbons must be much greater if these are bubbled through it than if they merely strike and flow along the surface. It is fairly obvious, therefore, that the less the depth of seal the better, and that entire absence of seal is calculated to give the best results; but it may be said to be unwise to reduce same to less than half-an-inch without some such sensitive means of governing the suction as a retort-house governor affords. The majority of exhauster governors are usually not nearly sensitive enough.

The object of the foregoing remarks concerning pressure and suction in retorts and depth of seal has been to make clear that the best carbonizing results, as regards quantity and quality of gas yielded, are obtained by reducing to a minimum, or abolishing, the seal, and keeping down the pressure in the retorts as low as possible without pulling on those in which no gas is being evolved, and avoiding even temporary suction or undue pressure in any of them. As before remarked, if the ascension-pipes are of sufficient area, and are kept clear, the pressure, even in retorts in which gas is being given off at the maximum rate, should not rise above that of the atmosphere. It is only with the help of retort-house governors that these conditions of working become practicable.



Retort-House Governor.

The governor usually employed in this capacity is the Charles Carpenter retort-house governor, made by Messrs. Parkinson and W. & B. Cowan, Limited. A sectional sketch of one of these governors, showing the connections, will probably convey a better idea of its principle and the method of mounting than could be given in a page of explanation. On top of the inlet-valve is a cast-iron box divided into two sections, marked A and B, and which may be described as inlet and outlet chambers—A being the inlet, and B the outlet. In the top of this box, and in the division between the two chambers, are round holes with machined edges, and of the same diameter as the governor connections. Above this inlet and outlet box is a cast-iron annular tank, in which floats a sheet-iron bell; the interior of same being open through the centre of the valve to the governor-inlet. Suspended from the crown of the bell is the valve, which is of the Cowan type. It consists of an iron cylinder, open at the ends, machined on its outer surface, and slotted in the usual manner. This valve closely fits in the above-mentioned holes in the inlet and outlet box, and has a vertical travel in same.

Thus the gas, entering the inlet-chamber A at the bottom, is forced to pass upwards into the valve, then through that portion of the gas-ports above the division, and so into the outlet-chamber B. It will be seen that, should any variation in the amount of pressure or suction on the governor inlet or outlet occur, the bell will be almost simultaneously raised or depressed, so increasing or reducing the port area available for gas passage; and by thus varying the resistance opposed by the valve to the flow of gas, a regular condition of pressure, suction, or equilibrium can be maintained on the governor-inlet—that is to say, in the hydraulic main—the amount of such suction, &c., being regulated by the adjustment of weights on the governor-bell. It will, of course, be seen that, owing to the restricted area of gas passage in the governor, a much greater amount of suction is required to be exerted on its outlet than is obtained on its inlet. Thus, if working level gauge on the governor-inlet, the amount of pull

thrown by the exhauster will need to be something in the neighbourhood of 2 inches. This depends on the adjustments of the governor, the number of holes in the valve, &c. The governors are made in various sizes, to suit different makes of gas.

Two 8-inch retort-house governors have been in operation at the Stafford Gas-Works for seven months. They are mounted in the manner shown in the illustration. There is one governor each to two benches of four beds each, the beds containing nine 20-feet retorts; and they are situated in each case as close as possible to the junction of the foul mains from the two sides of the bench. No trouble whatever has been experienced with tar blockages; and the governors themselves require practically no attention.

Prior to their introduction, the hydraulic seal had an average depth of about 1½ inches, and the pull of the exhauster was kept as nearly as possible between 5-10ths and 10-10ths water gauge. It may here be worth while to remark that the liquor overflow arrangements are of such a type that whatever suction, &c., there may be in the hydraulic main, the same is also exerted at the point of overflow; no appreciable change in the depth of the seal could occur due to variation of such suction. The make of gas from April 1 to Sept. 1—that is, for the first five months of the working year now ended, and up till the introduction of the governors—was 11,527 cubic feet per ton, with an average quality of about 15·6 candles. When the governors were put in, the seal was reduced to about ¼ inch, and the pull on the hydraulic main was regulated to about 1-10th or 2-10ths. The top line on Diagram No. 1 is an enlarged reproduction of a typical suction record for a period of 24 hours, made on the governor-inlet. The lower and very irregular line shows the suction on the exhauster-inlet recorded over the same period. It would not, perhaps, be fair

Suction Records on Hydraulic Main Retort-House Governor Working.

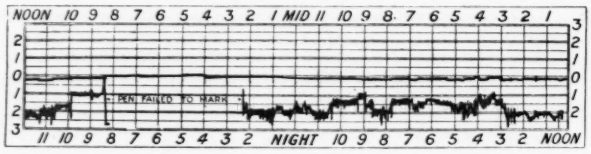


DIAGRAM No. 1.—STAFFORD.—Quarter-inch Seal. The lower line shows the Suction on the Inlet Exhauster Recorded over same Period.

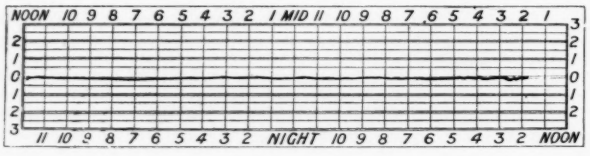


DIAGRAM No. 2.—LONGTON.—Dry Main.

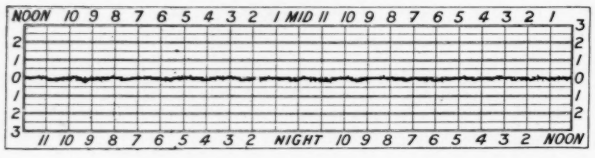


DIAGRAM No. 3.—LONGTON.—Liquid flush with Bottoms of Dips.

to the exhauster-governor to imply that it failed to prevent all the variations in suction here shown, because alterations were made in the weighting of same during the period over which the record was made. Temporary fluctuations, however, of as much as 1 inch may be seen which were in no way due to alteration of the weighting, and which the exhauster governor certainly did fail to prevent. At any rate, the two records together show how efficiently the retort-house governors perform their function, and what an immense improvement in working they effect where the suction thrown by the exhauster is at all liable to fluctuation.

Since the installation of the governors, the yield of gas has averaged well over 12,000 cubic feet per ton of coal, with a quality of 16·1 candles—an increase over the results for the preceding five months of the working year of over 500 cubic feet per ton and ½ candle in quality. Since the governors were installed, in addition to these gains in quantity and quality of gas, complete freedom from choked ascension-pipes has been experienced, and practically no scurf produced; thus reducing the wear and tear of the retorts. The same kinds of coal have been used throughout the year.

By the kind permission of Mr. W. Langford, the Engineer and Manager of the Longton Corporation Gas and Electric Lighting Department, the author has been enabled to gather a few details in connection with the working of two retort-house governors which are installed at the Longton Gas-Works. They are 8-inch size, and are arranged one at either end of a bench of retorts containing six beds of eight retorts each; the dimensions of the latter being 21 ft. by 22 in. by 16 in. One 8-inch governor was found to be of scarcely sufficient capacity to pass the maximum production of gas from this bench. The two foul mains are connected together at each end of the bench; and the two governors, mounted in each case just past the junction, are worked simultaneously, though either may be used alone. The governors were installed about eleven months ago. Previous to this, the depth of seal employed was about 2 inches, and the suction thrown by the exhauster about 30-10ths to 35-10ths.

On first starting the governors, it was tried working them in conjunction with a dry hydraulic main; the governors being regulated to maintain a level gauge in same. Diagram No. 2 shows how well they did their work under these conditions. Very good results were obtained; but difficulty was experienced by thick tar gradually depositing on the bottom of the hydraulic main in the form of pitch, which would not run off, but settled in a hard cake, and was very difficult to remove. It may be of interest to mention, in this connection, that the dip-pipes enter the hydraulic main through the side, and at a downward angle. Working with a light seal was next tried; but it was soon found that the yield of gas dropped below what it had been with the dry main. At the same time, however, the objectionable pitching up of the hydraulic mains was cured, and the tar from them run off without difficulty.

The liquor level was next adjusted, so as to bring it as nearly as possible about flush with the bottoms of the dip-pipes. These have now been the working conditions for some time; and practically as good results are secured as were obtained with the dry mains. Diagram No. 3, made two or three months ago, when gas production was heaviest, illustrates the effect in the hydraulic main at that time of this method of working, and is a typical example of the records then obtained. The reason that No. 3 record shows so much more fluctuation than No. 2 (which is practically a straight line), is attributed to the fact that, in the case of the former, the ends of the dip-pipes were in contact with water, while No. 3 was made when working with a dry main. It should be mentioned, however, that as the governors have now much less work to do than when the above records were made, they entirely prevent even the very slight fluctuation observable on No. 3; and lines are now obtained every bit as straight as record No. 2.

An increased yield of gas of 300 cubic feet per ton, with a gain of about 1 candle in illuminating power, has been experienced at Longton since the governors were installed, and due to their introduction. It is found necessary at Longton to clean out the governor-tanks and outlet-chambers about every three months, as these become coated with tarry matter, which makes the governors liable to stick. No trouble has been experienced with regard to blockages.

A short time ago, one of the governor-valves at Stafford was taken out for inspection after rather over four months' work, and was found, as might have been expected, covered with a thin coating of liquid tar. All the ports were, however, perfectly clear; and the whole valve, for all practical purposes, was quite clean. It may be mentioned that retort-house governors are not invariably fixed on bye-passes. One method of installing them consists in connecting the ends of two foul mains and mounting one or more governors direct on the connecting-piece. A short length of pipe from each instrument conducts the gas into the large outlet-main which leads to the condensers, exhausters, &c.

The few remarks here put together concerning retort-house governors and their working cannot pretend to contain any really new technical information; but it is hoped that they may, in the discussion, be the means of eliciting, for the benefit of the Association, useful opinions from members who have had experience in such subjects as have been touched upon.

Discussion.

The President (Mr. F. J. Bywater, of Nechells) having invited discussion,

Mr. A. O. Jones (West Bromwich) said they had an installation of retort-house governors at his works; but he was sorry to say they did not get such splendid results as at Stafford. At West Bromwich they used a dry main previous to the retort-house governor, whereas Mr. Wilson employed a hydraulic main. At his works they got a fairly level gauge before they put in the retort-house governors (about 2-10ths oscillation); and since having them there had been a gain of only some 70 cubic feet of gas per ton in the make, so that they really made no difference in this respect. Before their adoption the make was 11,115 cubic feet per ton; after, 11,176 feet. But, on the other hand, last year they used 50 per cent. of small coal, whereas this year they had carbonized 70 per cent; so that they had employed a poorer quality of coal and secured an equal make, while the benzol used for enrichment was about the same. He thought they had saved 3d. per ton on their coal; and this advantage accruing from the larger percentage of poor coal could be put down to the use of the retort-house governors. He should like to ask Mr. Wilson what amount of pull he had on the exhausters to get his increased make; and he should also be glad to know what sort of coal he used, and the proportion of beans and nuts.

Mr. W. E. Caton (Derby) said there were one or two questions he would like to put to the author. Supposing one of the governors was over-loaded, what provision had he to cope with this? Another point was, if the governor was over-loaded, would it be possible to work with the bye-pass valve partly open, and still

regulate the governor? He rather failed to see how the author obtained the increased candle power. The greater make could, of course, be accounted for, if one did away with the seal; but he did not quite understand how one was going to get any higher illuminating power from the gas.

Mr. T. Berridge (Leamington) said he should like to inquire what burner Mr. Wilson employed to get the 16-candle power with a make of well over 12,000 feet per ton. Of course, with the new Carpenter burner, it made all the difference; but for the ordinary burner, the results would be marvellously good. Over 12,000 feet of 16-candle gas made one's mouth water. He should also like to know what the leakage was at Stafford—whether it was normal or heavy. They were working at Leamington with Helps's displacing chamber in the hydraulic main; and they were making 11,100 cubic feet of 17-candle gas. If they could get such results with a retort-house governor as Mr. Wilson had stated, he would be inclined to order one at once. It was a matter that deserved great consideration, because anything that would enable them to cheapen their gas would assist them to compete with the electric light. It seemed to him to be a very good thing; and he should certainly make further inquiries with regard to it. He had found an increase of about 600 feet, without reducing the illuminating power at all, by adopting no seal—that was, from something like 10,500 to about 11,100 feet. Their gas was tested at the town hall by the Corporation, with a No. 2 Sugg burner.

Mr. S. T. Smith (Walsall) remarked that one or two questions occurred to him with regard to this comparatively new subject. The marvellous results that were heard of up and down the country, certainly opened one's eyes—or, as Mr. Berridge had said, made one's mouth water. The first thing that struck him was, Why have the governor fixed in between the two mains? Why was the small main fixed at all? It seemed to him they were throttling the gas straight away. The diameter of the outlet of the governor was not equal to the diameter of the single foul main, let alone having the two mains together. Another thing was the effect of the tar on the cone. He noticed that Mr. Wilson stated in his paper that no trouble had arisen from this; but it seemed to him (Mr. Smith) that it was one of the points that would have to be watched most carefully, and where there was most danger of a block. Mr. Wilson had a very big yield of a high illuminating power gas; and he also was curious to know what coal was used. Did they employ any form of enrichment at Stafford; and, if so, was it the same during the high make of 12,000 feet as when they were making 11,500 feet? He noticed that the author drew attention to the point that No. 3 record showed much more variation than No. 2, and said this was attributed to the fact that in the case of the latter the ends of the dip-pipes were in contact with water, while No. 3 was made when working with a dry main. At Walsall, they had a dry main in one retort-house and a hydraulic main in the other; and they certainly needed no governor to get a straight gauge on the dry main. They got a straight line without any governors; and it seemed a pity to go to any expense to arrive at the same results in another way.

Mr. P. C. Balcon (Swan Village) said he should like to know whether the gentlemen who had given them these abnormal makes were including water gas or any other than coal gas in their calculations.

The Hon. Secretary (Mr. J. Hewett) said there was no doubt that the retort-house governor had vastly improved matters at Stafford; but, as would be seen on reference to the first record on illustration No. 2, the pull at the inlet of the exhauster there varied some inches, whereas with efficient governing the variation should not exceed 1-10th of an inch above or below the desired pull. He did not know of any governor which, as Mr. Leslie Wilson said, would repond to any increase or decrease on both its inlet and outlet side; it did not appear that the one illustrated would do this. He (Mr. Hewitt) was further of opinion that retort-house governors might usefully be employed in conjunction with some anti-dip contrivances, instead of displacing them. This was borne out by records Nos. 2 and 3; a more even line being obtained with the liquid in the hydraulic main some distance below the underside of the dip-pipes than with it flush with same. For instance, with a retort-house governor arranged with the Helps displacer, it would be possible, without fear of overdrawing, to carbonize with the dip-pipes unsealed, and when the mouthpiece-lids were opened for drawing and charging, to ensure certain sealing of the dip-pipes, by putting the displacer into action.

Mr. G. W. G. Tatam (Saltley) said he was sure they were all very pleased to have heard the paper, and to have learnt that some works could do very much better than they did themselves. He certainly agreed with the other speakers that the large yield of gas after putting in the retort-house governors was rather difficult to explain; but after having had experience with the Helps displacer chamber anti-dips, it appeared to him that the thing, after all, was not quite beyond possibility, because even with the Helps displacer one could not get, on the inlet of the exhauster or anywhere else on the inlet side of the exhauster, a level line. The charts on the inlet of the exhauster with the plant he had in mind would show an oscillation; and it was impossible to get an actually level gauge. But it appeared that with the retort-house governor one was able to secure this absolutely level line; and if this was the case, then, if they considered that when working with ordinary dry mains one had to keep the exhauster always at a slight back-pressure on the inlet side, so as to guard against overpulling, while with the retort-house governor it was possible to guarantee the absolutely atmospheric condition of the hydraulic main—if they considered that they could do this with Cowan's governor, and with any other type of dry main they had to keep for safety's sake on the pressure side, though the figures seemed rather astounding, he thought there was something in favour of them. Mr. Berridge said that his make was 11,100 cubic feet per ton of 17-candle gas. If they multiplied the candle power by the make of gas per ton of coal carbonized, they would find that Mr. Wilson's best figure—that was, "well over 12,000 cubic feet per ton," after the inauguration of the retort-house governors—worked out at not such a very great deal more than that of Mr. Berridge. Of course, there was quite a substantial difference; but if they brought the matter down to this basis, the figures seemed more feasible than at first glance. He should like to ask Mr. Wilson what kind of exhauster he was using, and also what type of governor he had for his exhauster. They saw on No. 1 chart that the gauge-line for the inlet of the exhauster was very uneven; and he thought that, judging from this chart, the type of exhauster governor that was being used was not one that could be relied upon. He did not agree that it was not possible to get effective governing on one's exhauster, because he had evidence that it was practicable to keep within 2-10ths difference—either 1-10th pull or 1-10th back-pressure. He would therefore be pleased to hear why Mr. Wilson said the governing of the exhauster could not be regulated. Then as to the make which Mr. Wilson quoted before the introduction of the retort-house governors, when the hydraulic seal had an average depth of about 1½ inches, and the pull of the exhauster was kept as nearly as possible between 5-10ths and 10-10ths water-gauge. He (Mr. Tatam) hardly saw how the author could get 11,527 feet of 15·6-candle gas under these circumstances, unless it was by the aid of absolutely first-class coals. In fact, with first-class coals—he had experience two years ago of several Yorkshire coals—he found that, sometimes actually overpulling and at the most not working with more than 2-10ths pressure on the retorts, they got 11,500 feet of between 13 and 14 candle gas; and, as far as they could discover, this was all the coals would produce. So that, as far as he was concerned, the figures here seemed very abnormal. He could not agree with Mr. Smith's experience, when he said that he was able without a retort-house governor to keep a level chart when using a dry main; because, as he had previously pointed out, one had for safety's sake to keep on the pressure side. He would like Mr. Smith to tell them what means he had of governing his exhauster to keep a level gauge. He would also be glad if Mr. Wilson would tell them the kind of coal he used, the temperature of distillation, and the length of time the retorts had been in use. This information would be of assistance to them.

Mr. Jones said that at West Bromwich they were tested against an examiner at the Town Hall; and he would like to know if Mr. Wilson had the same restrictions at Stafford. He noticed, reducing the makes of gas at Stafford before and after the introduction of the retort-house governors to sperm value, that the figures came out at 650 lbs. before using and 662 lbs. after. So that the increase was just 2 per cent., which was about the same result as at West Bromwich. But the make at Stafford seemed to be rather abnormal in the first place, so that the question of the coal was an important matter.

Mr. Tatam said he had one further question to ask. What was Mr. Wilson's method of testing his gas? What apparatus did he use; and did he test at the inlet of the holder so many times a day, or collect a sample in a small holder over a certain number of hours, and make his tests from that? An answer to these points would help them to judge whether the large value of 12,000 feet of 16-candle gas was really what it appeared to be—something in excess of what they had known so far.

Mr. C. M'Pherson (Nechells) said he thought the point of the whole matter was that the plan described by Mr. Wilson gave a governing action nearer to the retorts, which undoubtedly was a help, and would give them an advantage in the make of gas and also in the illuminating power. He could endorse what the other speakers had said about the pull on the exhausters being very difficult to maintain; but a great deal depended on calculating the areas of the various mains and the ascension-pipes. The area of the hydraulic main had a lot to do with the amount of cubic feet of gas one was trying to pass through in a certain time. At many gas-works which he knew, these calculations were not taken into consideration with sufficient accuracy.

The President, in proposing a hearty vote of thanks to Mr. Wilson for his paper, remarked that he had referred to the evils of a heavy pull. He did not think there was any doubt that the heavier the pull on the hydraulic main, the greater was the oscillation. The question of oscillation in the hydraulic main was a very important one, and was ignored to a greater extent than it should be. A small pull was the thing to be aimed at with the use of a hydraulic main; and if one was not going to employ a governor, it was impossible to do better than get the pull down to a minimum and use as little seal as practicable. They could not put the retort-house on the top of the exhauster; and therefore if they could govern on the spot of production—that was, near the hydraulic main—there was in his opinion no doubt that it must be a good thing. Still, he must agree with members who had expressed some doubt about the results Mr. Wilson had obtained. He would, however, like to hear what he had to

say with regard to the coals used, because it was the old question again. A man might say that he got 11,000 feet of 15½-candle gas from one class of coal, and then he put some contrivance in and obtained a very much better yield and increased the illuminating power; but he thought it ought to be stated what the coals were. It was no good knowing what one was getting, if one did not know from what class of coal it was being got. Also the analysis of the gas would be useful. What was Mr. Wilson getting when he was obtaining 11,000 feet per ton? because it was his (the President's) opinion that with an exhauster run like his, he might get a lot of air and carbonic acid. If the line shown was the best that could be obtained without a retort-house governor, they were certainly well advised to have the governor put in. He thought, however, that this could not be taken as typical of the working of an exhauster, under the best conditions, at any rate. Many ideas had been advanced for getting over this question of oscillation. After all, this was what had been aimed at at Stafford—overcoming the oscillation which one must get in the hydraulic main, owing to the variations in the production of gas and in the pull. He did not think that any of them had been successful, except the reduction of the pull to a minimum. At his works, they had tried putting a perforated sleeve round the dip-pipe for the gas to bubble through; and this seemed to reduce the oscillation considerably. They did not appear to get very much pressure on the retorts; and they did not experience so much variation. Another thing was a serrated edge round the bottom of the dip-pipe. As he had already remarked, the question of oscillation was very important, both in the matter of the production of gas and the securing of a constant quality; and if Mr. Wilson obtained the results which he said he could—and he (the President) would be the last to doubt his figures—he thought they should, with Mr. Berridge, try to get retort-house governors at once. Mr. Jones said that Mr. Wilson's improvement came out at about 2 per cent.; but he (the President) thought it was nearer 10 per cent.

Mr. Jones: I took it on pounds of sperm.

The President: I am taking it on candle-value.

Mr. R. A. S. Browning (Saltley) seconded the vote of thanks, and said he quite agreed with the President that the importance of governing the flow of gas as it came from the retort was not recognized as much as it should be. Not only did they get a poorer gas if the pull was too much; but, on the other hand, if the pull was too great, the retorts, he thought, suffered from uneven heating, and such things as that.

Mr. Wilson, in reply, said that, with reference to Mr. Jones's question as to how much pull he had on the exhausters, the top diagram showed this pretty well. The average was about 1½ to 2 inches.

Mr. Jones: We have 2 inches at West Bromwich.

Mr. Wilson (continuing) said the coal used was all North Staffordshire—from the Birchenwood, Bignall Hill, and Madeley Collieries. He was sorry to say that he was unable to give any details as to calorific value.

Mr. Jones: What proportion do the beans and nuts bear?

Mr. Wilson replied that they were mostly beans and nuts—very little large coal. As to candle power, there were at Stafford no such restrictions as Mr. Jones had referred to; but as he had mentioned in his paper, the average quality of the gas had been 16·1 candles. This was tested by a Letheby bar photometer, with a 3½-inch flame and a Methven screen—ordinary coal gas being used, without carburetting. As to Mr. Berridge's query about the leakage, he thought last year it was somewhere in the neighbourhood of 5 per cent.; but it was, he believed, considerably less this year. Mr. Smith asked why it was necessary to throttle the gas. He (Mr. Wilson) thought it was necessary to do this in the governor in order to obtain the effect of governing. The results given in the paper referred to coal gas; there was no enrichment at all. They used a very small quantity of 17-candle water gas; but the amount was so little that it would hardly make any difference to the results of the tests, which showed 16·1 candles. The temperature of distillation was about 1800° approximately (he was unable to say the exact figure); and the duration of the charges was six hours. He might mention that they tested several times each day the illuminating power of the gas going into the town.

In appropriating a water power, the town of Harrisonburg (Va.) has recently encountered a singular legal difficulty. According to the "Engineering Record," it bought an existing dam, and served notice on the riparian property owners above it that it would be raised 10 feet. Commissioners were appointed to fix the damages to the upstream property caused in this way, and one of the items they assessed against the town was $3000 for the 10-feet fall in the river due to raising the dam. The town protested against such an award, because none of the riparian owners had property on both sides of the river, and consequently none of them owned any power privileges. The Supreme Court of Virginia has decided against this contention; ruling that the town could not take the several parts of a valuable whole from different property owners without compensation. "The parts are equal to the whole, in law and in logic," the Court said; "and if the entirety be of value, the parts which constitute the entirety must potentially be of equal value."

CYANOGEN RECOVERY AT THE AMSTERDAM (WEST) GAS-WORKS.

By D. Stavorinus.

At a recent Meeting in Birmingham of the Midland Junior Gas Engineering Association, Mr. J. H. Willoughby, of Leamington, read a paper on "Cyanogen Recovery," the effect of which was to cause the subject to be regarded from an entirely new point of view. Up to the present time, sulphocyanides have always been dealt with as waste products, and a loss of cyanogen has occurred both in the spent oxide and in the products resulting from the wet systems. Just now the market is favourable for sulphocyanides; but will they not be detrimentally affected when their production is increased? The cyanogen question is one of great interest for all who are engaged in gas-works, as every manager has at some time or another to decide which system gives the best results and yields the greatest profits. It is not only the problem of extracting the cyanogen that has to be faced, but also that of converting it into some marketable product. As a decision on any question is assisted by knowing the advantages and disadvantages of the existing systems, it may be of interest to your readers if I give some particulars and statistics in regard to the working of the modified Knublauch system in use at the Western Gas-Works, Amsterdam.

The first method for purifying coal gas from cyanogen and its compounds by the wet process was patented by Herr Knublauch in 1888. The patent is a very comprehensive one, as it includes almost every theoretically possible combination of systems and chemical products. It does not contain, however, any information as to the stage of purification reached when the gas has to be treated for the extraction of the cyanogen. In 1892, another method was patented by Mr. William Foulis, the salient features of which are that the gas is washed and scrubbed in the ordinary way before the cyanides are obtained. Both systems aim at the production of alkaline ferrocyanides. When the introduction of the Macarthur-Forrest cyanide process in the gold mines of the Transvaal caused a great demand for ferrocyanides, and the prices of all cyanogen products increased, the Imperial Continental Gas Association, who until 1898 were the owners of the Amsterdam Gas-Works, had a plant of small capacity put up to produce sodium ferrocyanide. The cyanogen was extracted in a Holmes washer-scrubber having a capacity of 30,000 cubic metres per day (about 44,120 cubic feet per hour).

When the gas-works were acquired by the Municipality, in 1898, this plant was very carefully investigated. The method employed by the Association for recovering the cyanogen, and converting it into a saleable product, was found to be a combination of the Knublauch and the Foulis systems. The washing-liquor employed for the extraction of the cyanogen contained a certain percentage of potassium carbonate in solution and basic ferrous carbonate in suspension—the ferrous precipitate being prepared with copper as solution and sodium carbonate. The course of the gas through the various portions of the plant on the works was at that time as follows—viz., exhausters, Pelouze and Audouin tar-separators, three scrubbers, cyanide washer, and purifiers. The scrubbers were of sufficient capacity, taking into consideration the quantity of gas then produced, for removing from it the whole of the ammonia. When passing the outlets of the scrubbers, a portion of the total bulk of gas went straight to the purifiers, as the capacity of the washer was inadequate for dealing with the entire production. So that, in the working of the system, the absorbent liquor was employed in accordance with the Knublauch method, whereas the recovery of the cyanogen from the gas previously freed from ammonia was a prominent feature of the Foulis arrangement. The investigations conducted showed that the cyanogen in the gas treated in the washer was extracted to the extent of only about 70 per cent.; the rest passing the outlet intact. An increase in the concentration of the alkaline ferrous liquor had no effect on the absorption of the cyanogen; the figures relating to that which passed the outlet of the washer showing no decrease.

As no satisfactory results were being obtained, the cyanogen problem was investigated from an entirely different standpoint. By the application of the laws of modern physical chemistry, it was ascertained that theoretically the total extraction of the cyanogen was only possible when, during absorption in the iron in suspension, the greatest possible quantity of ammonia was present; and also that when ammonia was absent complete absorption was impossible. It would occupy too much space if I referred to all the theoretical considerations bearing on this subject. I will, therefore, merely remark that the basis of the whole matter is to be found in the Guldberg-Waage law of the chemical energy of masses. The investigations with foul gas carried out in the laboratory testified to the correctness of the theories formed; and as these showed that the arrangement of the cyanogen plant was defective, the course of the gas was altered, and it was allowed to pass directly from the tar-separator into the cyanide washer. The results obtained in practice proved the correctness of the theory, as the absorption of the cyanogen was complete, even when the washer had to deal with a bulk of gas far greater than its capacity. The figures in regard to the extracted cyanogen now varied between 98 and 100 per cent. This showed most

unmistakably that the principal defect of the Foulis system was to be found in the total absence of ammonia during the absorption of the cyanogen.

The problem having so far been solved, the capacity of the ferrocyanide plant was enlarged by the erection of another Holmes washer-scrubber capable of dealing with 3½ million cubic feet of gas per day; but before describing the working of the plant, I will explain briefly the chemical action which goes on in the washer. The liquor contains, as already mentioned, basic ferrous carbonate—*i.e.*, a mixture of ferrous hydrate ($Fe[OH]_2$) and ferrous carbonate ($FeCO_3$). As it might be impossible to avoid the oxidizing action of the air during the preparation of the liquor, some ferrous hydrate is oxidized to ferric hydrate ($Fe[OH]_3$), and a quantity of potassium carbonate dissolved in it. The coal gas to be treated in the washer contains, in addition to the compounds of the purified gas, a quantity of sulphuretted hydrogen, hydrocyanic acid, carbonic acid, and, in our modified system, an excess of ammonia; the latter causing the first-mentioned acids to be regarded as ammonium compounds. In accordance with the laws of dissociation of gaseous compounds, and as the acids are all of the weak type, these ammonium compounds have a dissociated form, which increases their energy for chemical action.

When the fresh liquor enters the first bay of the washer (at the gas-outlet), it comes into contact with gas which is almost freed from hydrocyanic acid. As there is in it an excess of sulphuretted hydrogen, the first thing that occurs is the interaction between H_2S or Am_2S and the iron salts. Ferrous hydrate is very rapidly transformed into ferrous sulphide (FeS). The reaction with ferrous carbonate takes place relatively slowly, and only a part of this salt is sulphuretted, as there is to a certain extent equilibrium between the components. The reaction

$$FeCO_3 + H_2S \rightleftarrows FeS + H_2CO_3$$

is a reversible one. This has been proved by the fact that when a suspension of ferrous carbonate (without potash) is treated with sulphuretted hydrogen for about 24 hours, a precipitate is formed, which, on being dissociated by diluted sulphuric acid, yields a gas consisting of carbonic acid and sulphuretted hydrogen in the proportions of two-fifths of the former and three-fifths of the latter. The small quantity of ferric salt in suspension is transmitted into ferric sesquisulphide (Fe_2S_3). The formation of ferrous sulphide renders the iron salt not inert to cyanogen absorption, but, on the contrary, of great importance, as this product is very active.

When flowing through the succeeding bays of the washer, the liquor comes into contact with gas containing a greater quantity of hydrocyanic acid. Between the ferrous carbonate, ferrous sulphide, and potassium carbonate on the one hand, and hydrocyanic acid (or its ammonium salt) on the other, chemical action is quickly set up. First there is absorption of the cyanogen by the potassium carbonate, so as to form potassium cyanide (KCN). Ferrous sulphide dissolves in potassium cyanide, but only very slowly, when alkalines are absent; but, as Liebig pointed out as long ago as 1841, the velocity of dissolution increases greatly with an increasing quantity of alkali, whether carbonic or caustic. In this phase of the absorption, we find the principal difference between the Foulis and Amsterdam systems. With regard to the former, there is only the fixed alkali in the solution, which adds to the action the quantity of free potash decreasing towards the end of the absorption. In the Amsterdam system, on the contrary, the action of the fixed alkali is not only greatly reinforced by the considerable quantities of ammonia dissolved in the liquor and present in the gas, but also when, towards the end of the absorption, the amount of free potash decreases owing to the formation of ferrocyanic salt, and the ammonia takes its place. There is thus always at hand the greatest possible quantity of alkali for the chemical action. It may be easily seen that by the latter method the absorption must take place much faster and be more complete than by the former.

The total scheme of the reactions is as follows:—

$$Fe(OH)_2 + H_2S = FeS + H_2O$$
$$FeCO_3 + H_2S = FeS + CO_2 + H_2O$$
$$FeCO_3 + 2\,K_2CO_3 + 6\,Am\,CN = K_4Fe(CN)_6 + 3\,Am_2CO_3$$
$$FeS + 2\,K_2CO_3 + 6\,Am\,CN = K_4Fe(CN)_6 + 3\,Am_2S$$
$$FeS + K_4Fe(CN)_6 = K_2\,Fe\,Fe(CN)_6 + K_2S$$
$$2\,FeS + 6\,Am\,CN = Am_2\,Fe\,Fe(CN)_6 + 2\,Am_2S.$$

The presence of ferric salt causes the formation of some Prussian blue. The practical result of the washer action is a black liquor, being a mixture of a clear yellow solution with a blue-black precipitate. The solution contains potassium ferrocyanide, potassium sulphide, the excess of potassium carbonate that has not taken part in the reaction, and different volatile ammonium salts. The precipitate is chiefly composed of ferrous sulphide, potassium ferrous ferrocyanide, and ammonium ferrous ferrocyanide (the cyanogen compound in the Bueb mud). The preceding equations prove that some carbon dioxide is set free. In the Foulis process, the gas being free from ammonia, the carbon dioxide goes with the gas. In the Amsterdam system, the great surplus of ammonia fixes it; carbonate of ammonia being formed, which is either dissolved in the washer liquor or taken out in the scrubbers. The amount of carbonic acid increases with the percentage of cyanogen in the gas; 2·5 grammes of hydrocyanic acid per cubic metre of gas corresponding to about 1 litre of CO_2—*i.e.*, 0·1 volume per cent., which is an increase that might be neglected in practice. The reactions also prove that the sulphuretted hydrogen is not fixed, but that the greater part is eliminated in the form of ammonium sulphide. The figures arrived at in practice show that, on an average, 10 per cent. of the total quantity of sulphuretted hydrogen is fixed in the washer.

(To be continued.)

THE GAS-STOVE AS A GAS-SELLER.

In the outline of the programme for the first annual meeting of the American Commercial Gas Association which was given in the "JOURNAL" for the 30th of January, it was mentioned that there were to be two papers on the subject of gas-stoves. One was on "The Gas-Stove as a Promoter of Gas Sales, from the Manufacturer's Standpoint"—the author being Mr. O. E. Moon, of Cleveland. As some of his remarks are applicable this side the Atlantic, we give the following extracts from the paper.

Gas-stoves have promoted gas sales in the past, and they will do so to a much greater extent in the future. Among gas appliances, cooking-stoves occupy a prominent position; and unless there should be a very material reduction in the price of artificial gas for domestic heating purposes, they will continue to be the most attractive vehicles for increasing the sale of gas. The field of operation for the gas heating-stove is unlimited, if only the cost could be brought to a point that would compare with coal. The efficiency of the average coal-range is low, while that of the gas-range is high. Comparing coal-stoves, the efficiency of the coal heating-stove is much higher than that of the coal cooking-stove. Therefore, it would seem that the door is wide open for a great advancement of the gas cooking-stove. A high-class gas-range is to-day the most satisfactory cooking appliance to be found.

The measure of the increase in the sale of gas will depend largely on the efforts of those who are in direct contact with the consumer; and in order to effect a large development, the gas manager should have unlimited confidence in the position he occupies relative to the gas-range. It would seem that too many look only to the number of ranges which can be installed; thereby losing sight of the needs and requirements of the consumer. The strongest competitor the gas-range has is the cast-iron and steel coal-range.

Gas is, without question, the fuel for the kitchen; and neither it nor the appliance should be handled as a "cut rate" or a cheap "job lot." The small gas-range is good in its place; but the place it most generally occupies is to increase temporarily the output of gas, which is needed for some good and sufficient reason. The gas manager who is building permanently, however, and expects to assume the responsibilities of his business indefinitely, has not much use for the small cheap range. The larger and better the range installed, the greater satisfaction will ensue to all interested parties. The price paid for the range is soon forgotten; but an unsatisfactory appliance is a continual source of discontent and criticism. Further, the cheap small goods have not the character of permanency or stability desirable from the gas company's or the gas-range manufacturer's standpoint. From the gas company's, the consumption by these small units fluctuates very much, as they are mostly installed as merely auxiliary appliances; while a large, well-equipped range will show a much more steady consumption, as it will be in use more regularly, and in most instances will be the only cooking-stove used. From the manufacturer's standpoint, the matter of breakage in transit, repairs, and general lack of stability, make the cheap range undesirable.

Arguments can, of course, be brought forward to justify the use of small auxiliary appliances, such as cookers, single-oven ranges, and small-sized regular ranges; but will the arguments hold water? In most instances, a good high-class gas-range can be installed at a price not to exceed that of a medium-grade coal-range; and the satisfaction to be obtained from a high-class range is much greater than from a coal-range. If a gas-range is installed at a cost of $25, the consumer will not complain of a $3 per month gas bill nearly so quickly as he will of a bill of $2 per month for a $9 installation. The character, capacity, and general appointments of a high-class range will make the consumer feel more kindly towards the whole transaction; and the small appliance very seldom meets the requirements of the consumer.

Is not the gas man shirking his responsibility when he does not study the requirements of his customer and provide something which will fill the bill? Taking into consideration the fact that there are very few prospective customers who are in a position to judge of the merits of a gas-range, as it is probably their first purchase, the responsibility rests with the party selling the appliance. The gas company's opportunity to improve the general quality of the gas-range is great. Then why not make the gas-range installation a high-grade proposition instead of a cheap one—making every effort to sell large ranges, provided with the best practicable appointments, such as side broilers, canopies, warming closets, &c. A customer who buys his second range usually purchases something a great deal better than he bought the first time; and if a little study and work had been put into the first sale, a much better range would have been originally installed. The large ranges naturally increase the cost of installation; but price is only a matter of comparison. People will

pay the price, if only the proper enthusiasm and "hustle" are put into the work.

Here comes an argument from the gas manager, which is that, to the average canvasser and "floor man," all gas-ranges look alike, and the salesmen sell the goods which are the most easily sold. That is true, unless the gas manager can inspire his sales department with enthusiasm; and one of the surest methods of doing this is to make it worth while. A gas appliance canvasser who only works so many hours a day, and is expected to bring in so many sales, will do it in the easiest possible manner; but if he has something more to strive for, a difference will be noted in his work. If he is worth a certain sum per month and his sales are principally small ranges, give him, in addition to his regular salary, a certain bonus for every 18-inch double oven range he sells, twice as much for every side-broiler range, and three times as much for every six-hole range, and so on. A graduated bonus to canvassers and shopmen will work wonders in the quality of the appliances sold, and develop many a medium or poor man into a very capable one; and the gas manager will be relieved of certain responsibilities in handling these people, as the inducement that will be held out to them will be sufficient to make them push business on their own account.

Every effort should be made to instal cooking appliances which will entirely displace other fuel in the kitchen and laundry; and when the canvasser is on the ground, that is the time for him to suggest and advise, and bring to bear his entire influence, in such a manner that a sale of better goods and of larger capacity will be the result. His influence in this line of work can be made much greater than would seem possible at first glance. A large number of gas-ranges now installed are auxiliary appliances, and can and will be replaced by larger and better ones.

The argument is brought forward that at the gas office there is not enough floor-space to show more than two kinds of ranges, or that it is undesirable to show more than one or two, as it is not wise to create in the customer's mind too much confusion by having a large line involving a great many details. Our competitor the coal-stove man does not hesitate to duplicate and complicate his line, as he finds it to his advantage to have a large display. Where such a condition exists, why not call in the retail dealers and get their help? In some instances, gas companies have felt that the condition could be improved by taking into partnership, so to speak, the retail dealer; and they have found him a very willing helper. The main point in getting the retailer fully interested is the item of profit, as it is necessary for him to make his profit out of the appliance. As already stated, the matter of price is purely comparative, as long as the selling figure does not carry an unreasonable profit. If the gas-range will show the retailer as good a percentage of profit as a coal-range, he is well satisfied.

The retail dealer in stoves, house furnishing, &c., has a large acquaintance, and, in addition, personal friends; and as his business is complete kitchen furnishings, his help or hindrance is worthy of the gas manager's consideration. I personally believe that the general gas situation would be improved if the gas company would put a price on gas appliances that would permit the retail dealer to be thoroughly interested. People will pay the price if they can be assured that they are getting value for their money; and there is nothing easier than to show that a good range, to burn good gas, is the best value to be found. If the gas company's and the retailer's price should be about the same on a corresponding piece of goods, which would carry a reasonable profit, the gas company would not have so large a deficit to figure on each range, and therefore could afford to spend more money in advertising gas for the kitchen. But even with the retailer's help, the burden of advertising and pushing gas as the kitchen fuel is with the gas company. The gas-range manufacturer stands ready to furnish whatever is required; but the desire and ambition of the manufacturer are to improve the character, quality, and appointments of his product, which he will do just as fast as the gas man will accept them. But when the situation continues to resolve itself into a matter of price, and price alone is the ruling element, then the manufacturer spends his time in studying how to cheapen his product and expenses, instead of how to really improve the general conditions of his business.

The question is sometimes asked why range manufacturers do not advertise more liberally. One good reason is that the maker, whose output is almost or entirely gas-ranges cannot afford to do so, as the margin of profit is not sufficient. Another answer worthy of attention is that the manufacturer has no assurance, in working in the only avenue for marketing his product with the community, that he will be enjoying this privilege six months hence, as it may be found that his price is too high, and that all chances of doing business are gone. Take, on the other hand, our competitor, the coal-stove man, who is able to do a lot of advertising, give demonstrations, hold exhibitions, &c. This he can do because he has the assurance that his advertising will help to create a demand, which can be supplied through some of the various dealers of a city. If the gas man can see his way clear to give the manufacturer proper encouragement, the result will not be disappointing. Let the gas man spend money in advertising good gas, and the manufacturer will spend it in making and advertising good high-grade gas-ranges. In conclusion, let me urge people to pay a fair profit on each product, and then all will be happy.

STUDENTS' VISIT TO THE ELLAND GAS-WORKS AND GRID-WORKS.

Hearing that the students of the Yorkshire classes conducted by Mr. W. Cranfield were, in the course of the session's work, going to visit the Elland Gas-Works, Mr. Spencer (whose name is familiar in connection with his "Hurdle" grids for purifiers) extended them an invitation to see his grid-works. The visit was paid on Saturday, after an interesting and profitable time had been passed at the gas-works which are presided over by Mr. Robert Porter, in whose enforced absence the honours of the occasion were done by his son, Mr. Ben Porter, assisted by several members of the staff. The very complete and varied arrangements for unloading barges, elevating, and conveying the coal were shown in actual operation—two types of elevators and three of conveyors; and all present were struck with the prescience, judgment, and courage that had been displayed in making this undertaking one of the earliest pioneers in the introduction of labour-saving devices into medium-sized gas-works. On their arrival at the grid-works, the full range of specialized machinery for working up wood into grids of various types was shown and explained, among them being two specially arranged for making and fitting the bars of the new grids. Each was then set to work on its special pieces of timber. Sets of grids of the ordinary and various other types had been set up, including the "Hurdle" grids and another type also patented by Mr. Spencer; and they were closely inspected. The "Hurdle" grids were illustrated and described in the "JOURNAL" for April 18 last, p. 173. Mr. Spencer referring to them said they are the only grids that hold the oxide light, owing to the unique construction and the method of filling in from the top. The spaces being $3\frac{1}{2}$ inches apart, and the bars in the various tiers being directly in the centre of the spaces above, the oxide breaks its fall from bar to bar all the way down. Then the oxide is suspended among the various layers of grids in even compactness and of one equal density throughout the purifier—allowing for a much easier passage of the gas and diminishing back-pressure. With the "Hurdle" grids, purifiers could be filled to any depth without increasing the pressure, and reducing the pressure cast by the purifiers by probably something like 50 per cent.

THE USES OF PRODUCER GAS.

At the last Monthly Meeting of the Birmingham Association of Mechanical Engineers, a paper on "Some of the Uses of Producer Gas" was read by Mr. A. E. A. EDWARDS.

After a few introductory remarks on gaseous firing, the author said producer gas had been adopted for firing steam-boilers, iron and steel manufacture, driving engines, factory heating, lighting, and many other purposes. With regard to the first, one of the principal advantages was that the cheapest qualities of fuel might be used. As to the second, steel manufacture would be impossible without first converting the fuel into gas. Used in engines, producer gas required for its combustion much less air than town gas; but the adjustment of the air-regulator needed attention from time to time in order to get the best results. It was comparatively easy to make a gas-engine that would give, with certain kinds of producer gas, as large a card as could be obtained with town gas, by sweeping out the products of combustion and introducing clean air at the end of every exhaust stroke; but the additional economy would not be worth the outlay expended in securing it. With respect to the other uses of producer gas, Mr. Edwards said that lacquering-stoves for brass-workers were perhaps the easiest adaptation of it for heating purposes. They required 50 cubic feet of gas per hour per square foot of heating surface. Enamelling-stoves could be readily and cheaply heated by producer gas. At a cycle factory in Coventry, of the total annual consumption of gas for all purposes, one-ninth was used in the brazing-pipes. At a chandelier manufactory, 42 brazing tests were carried out on different articles; and the time occupied with producer gas was only three minutes longer than with town gas—being 26 min. 56 sec. with the former, and 23 min. 49 sec. with the latter.

Coming to the use of producer gas for factory heating and lighting, the author said Mr. Dowson invited him to see the system he used for heating the factory of his Company at Basingstoke. In a test made by Mr. Dowson, 262,000 cubic feet of air were raised through 81° Fahr. in one hour with 3150 cubic feet of gas made from 39 lbs. of anthracite. The loss of temperature in the air-ducts was 7°. The products of combustion left the heater at a temperature of 100° Fahr., carrying with them only about 7 per cent. of the heat of the gas. The total efficiency of the heater worked out at about 90 per cent. In the summer, fresh air was drawn from outside and delivered all over the building by means of the same fan. Mr. Edwards said he had not been able to adopt this system, as it was difficult to find anyone sufficiently enterprising. Producer gas, when burnt in connection with an ordinary albo-carbon gas-burner, produced a very good light with a flat-flame burner. The consumption was 25 cubic feet per hour. He had not conducted his experiments long enough to state accurately the consumption of albo-carbon. He thought there was no

doubt that producer gas would shortly be used with inverted incandescent gas-burners for factory lighting. He had experimented in this way, and found no difficulty in getting a good light with a burner constructed for the purpose. Of course, with any sort of lighting for interiors it would be necessary to further purify the gas, to get rid of the sulphur; but this required quite a simple piece of apparatus, which did not need much attention.

The author went on to deal with the use of producer gas in enamelling-kilns and annealing-ovens, and then proceeded to take up the subject of the waste of gas and its detection. He pointed out that in using producer gas for any purpose it is quite possible to waste the fuel, and it is often difficult to detect the waste without some technical knowledge. He therefore always advocated the keeping of a log, showing the quantity of coal used, the working hours, and so forth. The logs should be analyzed every month by someone who could understand what he wished to get from them. Several examples of logs in actual use were appended to the paper; and the author explained how they worked out in practice by giving the results of five months' operation of a bituminous plant.

Mr. Edwards now came to the cost of producer gas (*a*) compared with town gas (*b*); and to illustrate this portion of his paper he took a few examples of engines, and gave the annual running expenses. The first was one of 13 brake-horse-power working through the year at an average of 7-horse power, but at times going up to 10-horse power; and the figures were as follows:—

(*a*)	Anthracite, 1¼ lbs. × 7 H.P. × 7200 hours, at 23s. 6d. per ton	£12	8 0
	Water, 2 gallons per horse-power-hour	2	17 0
	Wages on plant alone, at 6d. per day	7	10 0
	Repairs and depreciation on outlay (£80), at 10 per cent.	8	0 0
	Total	£30	15 0
(*b*)	Town gas, total cost	31	0 0

This left 5s. to cover the rent of the space occupied, the removal of ashes, and so forth, without considering the question of being "hung up" some morning because the engine attendant was absent, and no one else knew how to run the plant.

Let them now take an engine of 25 brake-horse-power on town gas with an average working load of 14 brake-horse-power rising to 20-horse power at times:—

(*a*)	Anthracite, at the same rate as before	£24	16 0
	Water, as before	5	13 0
	Labour, at 9d. per day	11	5 0
	Depreciation and repairs on cost of plant and altering engine (£140)	14	0 0
	Total	£55	14 0
(*b*)	Gas at 23 cubic feet per brake-horse-power, 865,800 cubic feet, at 1s. 6d. per 1000	65	0 0

The balance in favour of the plant was £9 6s.—a sum which the author said was altogether inadequate to cover the extra trouble inseparable from the use of producer gas.

The next example taken was an engine of 50 brake-horse-power with an average load of 21 brake-horse-power, but occasionally working up to 35. The figures were as follows:—

(*a*)	Anthracite, at the same rate as before	£37	0 0
	Water, as before	8	10 0
	Wages, at 1s. per day	15	0 0
	Depreciation and repairs on total outlay (£140)	14	0 0
	Total	£74	10 0
(*b*)	1,316,560 cubic feet of gas, at 1s. 6d. per 1000	99	0 0

The balance in this case was £24 10s.; but Mr. Edwards pointed out that the economy would be greatly increased if the engine were more heavily loaded.

Taking a 150-horse power plant, with an average load of 100-horse-power, the figures were:—

(*a*)	Anthracite, as before	£178	0 0
	Water, 1 gallon per horse-power-hour	20	0 0
	Wages, at 15s. per week	39	0 0
	Depreciation and repairs on £400	40	0 0
	Total	£277	0 0
(*b*)	6,200,000 cubic feet of gas, at 1s. 6d.	465	0 0

In this case, said the author, there was some economy worth considering; but he really could not see how a firm could worry themselves with a small plant of 10 to 20 horse power for the trifling economy there was in it. Indeed, in actual practice, it was doubtful whether there was any economy at all, when the additional trouble in the office was taken into account.

The last example taken was a 150-horse power bituminous plant, working at 100-horse power. The figures were as follows:—

(*a*)	Coal, 2 lbs. per horse-power-hour, at 8s. 6d. per ton	£104	0 0
	Water, 2 gallons per horse-power-hour	40	0 0
	Wages, at 30s. per week	78	0 0
	Depreciation and repairs on £530	53	0 0
	Total	£275	0 0
(*b*)	6,200,000 cubic feet of gas, at 1s. 6d.	465	0 0

Mr. Edwards said it was not worth while to put in a bituminous plant for an average load of 100-horse power, and working for only 54 hours a week; but if the plant was run continuously, or if the power was greater, the advantage of using cheap fuel became of first importance. In all cases, the gas had been taken at the price charged by the Birmingham Corporation for engines; but if the gas was used in stoves, muffles, &c., town gas was higher in price, and the margin between the two systems was correspondingly increased. It was useless to compare larger-sized producer plants with town gas, except under special circumstances, because if the latter gas was used it was purely owing to space being of more importance than expense of running. He had purposely omitted from his figures the cost of engines, as this opened out the very large question of comparisons of various systems of power production. He could not, however, refrain from quoting one example of the cost of running by gas and steam in the same factory, where steam-engines (one of them a compound condensing engine) had been replaced by a producer plant and gas-engines. The steam-driven plant cost £412 11s. 6d.; the gas-driven plant, £320 4s. Here they had an example of a compound condensing engine of very good type, and kept in thorough repair, replaced by gas-engines and plant working at about half load, and yet realizing very substantial economy. What, asked the author, would be the economy in some of the brickyard or factory steam-engines in Birmingham to-day? It would be enormous; and he thought the gas-plant builders would do well if they opened a campaign against every user of a small steam-engine in the country, and left the small useful and economical gas-engine alone.

In conclusion, Mr. Edwards said he had not mentioned half of the points he had intended to touch upon. Nothing had been said of the use of producer gas for cooking purposes; yet it was a fact that it was employed for such work with thoroughly satisfactory results. Nor had he mentioned its use for the propulsion of vessels. His firm were now engaged in some tests in connection with this matter, and there was little doubt that the results would prove satisfactory to the owners. Much remained to be done in this direction, however, before the familar horse was removed from the towing-paths of our canals, and the turbines were taken out of our men-of-war. He explained that he had tried to confine his attention to plants in actual operation, where he had had the opportunity of personally checking the results. He had not given any figures made under test-house conditions. Nearly all were from ordinary every-day practice over extended periods; and the results were such as might be reasonably attained by anyone who adopted producer gas for similar purposes.

The Bueb Vertical Retorts.

The "Journal für Gasbeleuchtung" reports that the Imperial Continental Gas Association have decided, in consequence of the favourable results obtained with vertical retorts, to erect five settings of these retorts, 5 metres (16 ft. 5 in.) in length, at their works at Oberspree, near Berlin. Herr Körting took the opportunity offered by the meeting of the Brandenburg Association of Gas and Water Engineers to give a paper on "Vertical Retort-Settings," which will shortly be published. Herr Meyer, the Manager of the Dortmund Gas-Works, has decided to adopt vertical retorts in the reconstruction of that works, where ten settings will be erected. Herr Preuger, of Cologne, has advised the erection of 24 settings of vertical retorts at the municipal gas-works of that city; and they will be brought into use in the course of the year. Fifteen vertical settings will be erected for the extension of the gas-works of the Sociedad Catalana para el Alumbrado por Gaz, at Barcelona, also in the ensuing year.

Management of Messrs. C. & W. Walker, Limited.

It will be seen from the report which appears in another column of the proceedings at the annual meeting of Messrs. C. & W. Walker, Limited, held in Birmingham last Thursday, that an announcement was made by the Chairman (Mr. J. F. Wright) that Mr. Alfred Featherstone, the Managing-Director, was retiring from active work on the 3rd prox., and that the services of a new General Manager—Mr. Hugh F. Wright—had been engaged. It may be of interest to some of our readers to mention that thirty-three years ago Mr. Featherstone took up the position of leading assistant in the London office of the firm. He remained there until 1891, when he was removed to Donnington on the dissolution of the partnership of the two Messrs. Walker, and continued to hold the position until 1899. Two years after the death of the late Mr. C. C. Walker, the firm was converted into a Company under the title of "C. & W. Walker, Limited," and Mr. Featherstone was appointed as Managing-Director. He then entered into an engagement for seven years, which time will expire on the 3rd prox. It may be mentioned that in the period during which he has been Managing-Director, the firm have paid 12½ per cent. for the first year, 15 per cent. for the second, 20 per cent. for the next four years, and they have just paid a dividend of 15 per cent. for the seventh year; and the total results are that shareholders have received back in dividends more than the original capital they invested. Mr. Featherstone will retain his seat on the Board, and will be at the service of the Company whenever required. Mr. Wright, who has for many years held a leading position with Messrs. Ashmore, Benson, Pease, and Co., of Stockton-on-Tees, will be General Manager of the entire business; and it is to be hoped that the Company will continue to be as prosperous in the future as it has been in the past.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by Correspondents.*]

Use of Gas for Domestic Heating.

SIR,—It is noteworthy that Mr. B. H. Thwaite and Mr. Urquhart are crying out in the Press against waste of the fuel resources so bountifully provided for us; and each has his panacea. Mr. Thwaite recommends universal electrification; and many may consider his suggestion idealistic. On the other hand, Mr. Urquhart's suggestion is the universal adoption of gaseous fuel. This is a practical suggestion; and its adoption would remedy the existing ruinous state of affairs. I am hoping that municipal authorities will, in the near future, consider the matter. No greater benefit could be conferred upon a community than that of clearing the atmosphere from smoke pollution.

The before-mentioned gentlemen give figures showing that the capital expenditure entered upon would yield an ample return in profits, seeing that the smoke in the atmosphere would become residual products in value amounting to at least 7s. per year per head of the population. In asking Sanitary and Gas Committees to go into this matter, reformers are not, as is so frequently the case, suggesting the adoption of schemes needing high capitalization. The cost would be much less than the expenditure to-day on many less important betterments.

Action should be taken against householders who send smoke into the atmosphere. At present, they are allowed to go free. There is neither justice nor equity in this, seeing that immediately the atmosphere becomes unbearable, millowners and manufacturers are prosecuted without any compunction, while the greatest sinners are allowed to go free. Is it possible for our various Gas Associations to urge the importance of placing the punishment on the proper shoulders? It is much to be hoped that gas companies will take up this matter.

THOS. G. MARSH.

Manchester, March 30, 1906.

Purification Results.

SIR,—In answer to Mr. Kendrick, I may say, for his information, that our works are a fair average between Stalybridge and Stretford. Our maximum is over 900,000 cubic feet per day; and the make per ton last year averaged 11,485 cubic feet. We foul our oxide in three runs, and get paid for 64 per cent., and sometimes 68·50 per cent. of sulphur. What is more, we did not change any boxes during December, 1905. Can Mr. Kendrick claim that during his heaviest month? I do not think there is very much difference in the velocity of gas passing through our boxes and those of Stretford. Mr. Kendrick inquires how many boxes we have. As I said before, we have four boxes 20 ft. by 20 ft. by 5 ft., and change when the second shows foul (if we know soon enough), the same as other people. We have no washer, as we do not believe in costly patents when we can get good results without them. It is not so much the impurities that are in the gas, as the utilization of the other constituents to assist in the purification of gas.

In conclusion, I am very comfortabie here, and am not advertising for another berth, and leave the trumpet to others.

AN OLD FOREMAN.

March 29, 1906.

SIR,—Though our name is referred to in both the letters appearing in your issue of last week, there does not appear to us anything in them calling for further remarks from us, except that it may be to express our agreement with Mr. Kendrick "that the efficiency of a purifier depends on the velocity of the gas passing through it"—wherein exists, as we have already pointed out, the superiority of the Jäger system.

Those interested in the merits of the various forms of grids have before them the published figures, which, as we have said before, speak for themselves.

SAML. CUTLER AND SONS.

Millwall, March 31, 1906.

LEGAL INTELLIGENCE.

A FAULTY RESERVOIR AT CASTLEFORD.

Engineers and Council at Law.

A long case—the hearing of which extended over three days—has been decided by Mr. Justice Bigham and a Special Jury at the West Riding Assizes. Messrs. Richardson and Hartley, Civil Engineers, of Leeds, sued the Castleford Urban District Council to recover £1345 as balance due for professional services; while the defendants put in a counterclaim for £2000 for damages in connection with the carrying out of the work. Included in this total was an item of £950, the estimated cost of rendering the service reservoir at Redhill, Castleford, water-tight; £622 for loss of the use of the reservoir; and expenses incurred in investigating the defects of the reservoir and upon its reconstruction. With regard to the reservoir (there was also other work included in plaintiffs' claim), it was alleged by the defendants that the plaintiffs had forfeited their claim for professional services on the ground that they were bribed to give two certificates of completion of the contractors' work. It was asserted that the sum of £40 was paid by the contractors to the plaintiffs as a bribe for the giving of these certificates; and on this account the Council contended that the plaintiffs were not entitled to any remuneration at all. As to the bulk of the claim, it was alleged the charges were not fair and reasonable. Regarding the origin of the dispute, it was found that, owing to mining operations, a fissure had been caused in the bed of the reservoir; and the plaintiffs were instructed to examine it, and prepare a scheme and plans for remedying it. This was done; and in November, 1901, the Council resolved carry out the work, and applied to the Local Government Board for sanction to a loan. Prior to the inquiry, plaintiffs had consulted the Armoured Concrete Construction Company as to the laying of a mesh of iron in a concrete bed. The Local Government Board sanctioned a loan of £2460; and one of the conditions on which it was granted was that a twelve months' guarantee of stability should be given by the Armoured Concrete Company. Tenders were sought; and the Council received only two replies—one from the Company for £1752, and the other from Messrs. Pickthall and Sons, of Bridlington, for £866. This latter tender was a great temptation to the Council, who wrote to the Local Government Board asking if they could accept it. The Board replied that the Council must satisfy themselves that the persons to whom they were giving the work were of sufficient practical experience to carry it out. The plaintiffs objected to Pickthall's contract; but the Council decided to let it to them. Whatever defects had arisen in the construction of the work, plaintiffs said were due to a great extent to the inexperience of the contractors; and plaintiffs early advised the Council that they were not the sort of people to do the work. The certificates were given through the representations of the Council, who were being pressed by Pickthalls for payment.

Mr. Richardson, who is 75 years of age, stated in his evidence (which was taken on commission) that he exercised no supervision over the work; it was left to his partner Mr. Hartley. This gentleman, in answer to questions, said he was thirty years of age; and though he had no diplomas, he had experience. He gave general supervision to the work. He agreed that the armoured concrete was most unsatisfactory, though he had certified it up to 90 per cent. Pickthall had asked him to accept £40 if the job turned out satisfactory; but witness absolutely refused, as he regarded it as a bribe. His diary was produced to prove this. Mr. Waugh, K.C., for the defendants, thereupon intimated that he did not persist with the charge that the witness had received a bribe. However injudicious he might have been in his dealing with the contractors, the evidence did not justify that. After Mr. Hartley had been cross-examined at great length with regard to the charges made by his firm (both for work which was carried out and schemes which fell through), expert evidence was given by Mr. B. C. Simpson and Mr. E. J. Silcock on behalf of the plaintiffs. For the defence, the faulty character of the reservoir was described by Mr. F. G. Fairbank, who said that the work had not been carried out in accordance with the drawings. He attributed the bulk of the leakage to defective concrete, and said it would have been possible to detect whether good cement was being used by examining it during the progress of the work. He estimated that it would now cost about £950 to make it a good water-tight reservoir; while the original tender for the work only amounted to about £860. Mr. George R. Strachan and Professor Henry Robinson also gave evidence.

Mr. Justice Bigham, in summing up, said he could not help thinking that the defendants had acted very foolishly, inasmuch as they seemed to have had no proper bargain with Messrs. Richardson and Hartley. If the members of the Council had been dealing with the own money, they would have surely had it made clear to them what their liabilities were going to be. But they were dealing with the money of other people, and apparently took no particular pains to measure the liability of the public in the bargain they were making. In the absence of a bargain, however, the law prescribed that the amount should be fair and reasonable. Referring to one of the bills (for £614) sent to the Council by the plaintiffs, he could not help saying there was on the part of Messrs. Richardson and Hartley "an attempt at over-reaching, which came very near to dishonesty." This bill was sent in, he supposed, with the object of representing to the defendents that it was the money they owed, and ought to pay. But even the plaintiffs' own witnesses had not been able to support it. One of them considered it should be reduced from £614 to £441; while another reduced it to £372, or about £240 less than the amount charged. "No such bill should have been sent in by any respectable firm. They were not proper bills; and Messrs. Richardson and Hartley ought to have known they were not." The Jury had before them the startling fact that upon a sewage scheme which was never completed, bills were sent in by the plaintiffs to the amount of nearly £1500. A sum of £500 had already been paid. Plaintiffs made out that £887 was still due; while according to the defendants' evidence, it should be £387. With regard to the counterclaim, the Jury had to decide whether the plaintiffs had exercised proper skill, care, and intelligence. Mr. Richardson, the senior partner of the firm, had allowed Mr. Hartley, whom he might describe as little more than a boy, to have the whole responsibility for this important undertaking; and it was a question whether this could be described as reasonable care. The Engineers were undoubtedly deceived by the Clerk of the Works. Then it was proved that the Contractor had attempted to bribe Hartley; but, to the latter's credit, he proved to be above corruption. Yet he knew the character of the man he was dealing with; and instead of hushing the thing up, he ought to have acquainted his employers, and at least have been doubly careful in his dealings with the Contractor afterwards.

The Jury found that the plaintiffs were entitled to £550 beyond the sum previously paid to them; but as the Council had paid £600 into Court, this was in reality a verdict for them. They next found that the Engineers had been guilty of negligence, and awarded the Council £100 and costs; and against the Contractors, they awarded the Council £100 and costs, *plus* £139 which the Council had in hand as retention money, and the amount of the bond (£300).

His Lordship intimated that the verdict of £100 damages against the plaintiffs was a wise one, and entered judgment for the defendants on both the claim and the two counterclaims.

Gas Lighting for Trains.—The Lancashire and Yorkshire Railway Company, having found that incandescent gas lighting is more efficient than the ordinary system for station purposes, are now proposing to introduce it into their trains. An experiment is being made on the branch line between Horwich and Blackrod. A small specially-made mantle is placed in the carriage lamp, and so far the results have been very satisfactory.

REGISTER OF PATENTS.

Change Giving Apparatus, applicable for Prepayment Gas-Meters.—Hancock, J., Spann, S., of Tranmere, and Herbert, E., of Walton, near Liverpool. No. 4376; March 2, 1905.

The patentees lay stress on the "great disadvantage" of coin-freed gas-meters and the like, that there is an "enormous quantity of copper coins collected by the machines, which cannot be changed into coins of higher value until the machines are opened by the officials in charge;" and their invention has been designed to enable the lessee or owner of a prepayment gas-meter or other coin-freed apparatus to insert (say) a shilling into the meter and get change for it in copper coins. A device of this kind, they remark, "will greatly reduce the accumulation of copper coins in the machine, as the user, if he wants change, can at once obtain it in exchange for a shilling."

Further reference to the arrangement is not necessary here, as in another column to-day (p. 22) an illustrated description of the coin-changer appears, prepared from an inspection of a model sent recently by the patentees.

Incandescent Mantles and Burners.—Anderson, D., of Westcliff-on-Sea. No. 4673; March 6, 1905.

According to this invention the mantle is constructed in the form of a tubular or channel-shaped annulus—preferably continuous. It may also be in the form of a hollow disc, saucer-shaped, or more or less curved or flattened, and with a central hole. In other forms it may be likened to a pneumatic tyre around a hub or wheel-like support—the hub constituting the gas supply. The plane in which the mantle is disposed may be either vertical, horizontal, or at any suitable angle. The supply of gas and air may be directed into the mantle at suitable points or by a continuous opening, or series of openings; and such supply is situated on the smaller circumference of the annulus, or intermediate between it and the larger circumference, and in such manner that the flame is directed downwardly, or in a transverse or horizontal direction, and outwardly from the centre of the burner-head. The flame or products of combustion issue between the outer circumference of the mantle and the circumference of the burner-head, so that the flame need not pass through the wall of the mantle.

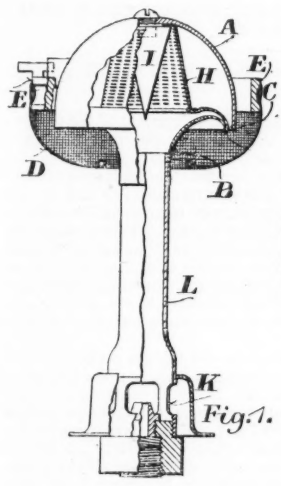


Fig. 1.

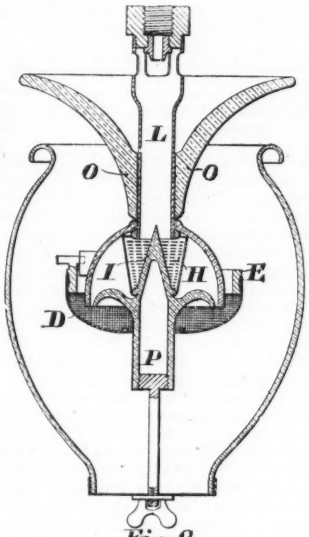


Fig. 2.

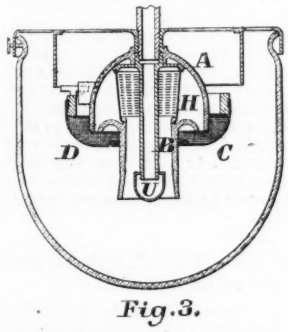


Fig. 3.

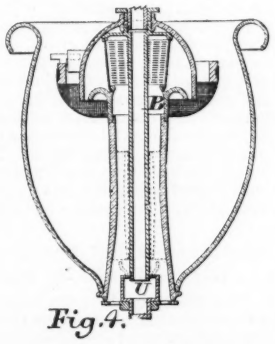


Fig. 4.

In fig. 1, an upright burner is shown with the burner-head or body part A in the form of a hollow casing of mushroom shape—being partly spherical on the upper side and having a tube B opening into it at its under side. The tube is spread to form the underside of the body part which terminates at a suitable distance from the edge of the portion A so as to leave an annular space C, forming the aperture by which the gas and air issue in a downward direction within the mantle D, which is formed in cross section to meet the shape of the annular flame. The mantle is in the form of a saucer-shaped annulus adapted to surround the tubular part B, which passes through a hole in the mantle. The outer edge of the mantle is fastened to a ring E, supported from the body part of the burner in the usual manner by lugs engaging with recessed lugs on the body part. The ring is spaced a suitable distance from the body part, so as to allow of the products of combustion from the flame to pass up between same. Within the body part is mounted a perforated shield H, disposed above the pipe B; and a spreading cone I, such as usually employed in burners, may be provided, if required, to secure an even distribution of the gas and air. The body part of the burner is mounted upon the upper end of an ordinary air and gas mixing chamber K, with the usual tubular extension L.

In operation, the gas and air from the mixing-chamber K passes up the tube B, and issues into the annular saucer-like mantle D by the continuous annular opening C; the flame passing downwardly in the form of an annulus, and then upwardly and outwardly again against the mantle towards the space between the ring E and the body part A, although it may also pass outside and around the mantle. The mantle thus presents an "annulus of light disposed beyond the tube B and mixing-chamber K, and, by reason of the mantle being beyond the support, any appreciable shadow will be avoided, and a better distribution of the light will be ensured."

If the burner is an inverted one, the construction remains very much the same as regards the disc-like body part and mantle—see fig. 2. Here the perforated shield H and spreading cone I are reversed, and the upper part of the burner is provided with a reflector O around the tubular extension from the air and gas mixing-chamber A. The open end of the tube B is closed by a plug P, which may support a gallery by means of downwardly extended rod—the gallery carrying a globe of suitable shape.

In fig. 3 is shown another form of inverted burner. In this, the gas supply is introduced at the top of the body part A by a pipe projecting through the body part by an extension which terminates at or about the entrance of the lower air-supply tube B; the pipe being fitted at its lower end with an upwardly directed nozzle U, which consists of a cap of slightly larger dimensions than the end of the tube, so as to allow of the gas-jets being formed in its upper edge. These gas-jets are adapted to direct the gas supply upwards into the air-tube B in such manner that the gas and the air in the air-supply tube will mix in the interior of the pipe and body part, and then issue, by the annular nozzle C, to the interior of the mantle, as previously described.

Fig. 4 shows a construction similar to fig. 3, but with the lower portion of the tube B extended downward for a considerable length, so as to open a distance from the burner or outside the globe. The globe is secured by a nut attached to a nozzle, so that, on unscrewing the nut, the globe and the lower part of the tube B may be detached and a new mantle put into position.

Controlling the Supply of Gas from a Distance.—Gilbert, E. W., of Asylum Road, Peckham, S.E. No. 4865; March 8, 1905.

This invention primarily has for its object to enable the supply of gas to burners at one or more points in a room to be turned on or off from

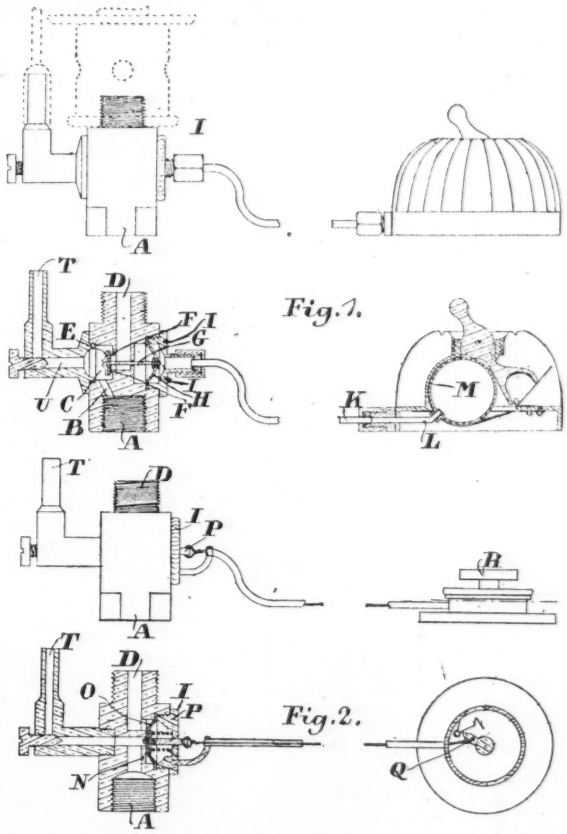


Fig. 1.

Fig. 2.

any desired point (in the room or outside the room) distant from the burners to which the supply of gas is controlled. It consists mainly of three elements: (1) The switch; (2), the valve; and (3), means connecting the switch and valve.

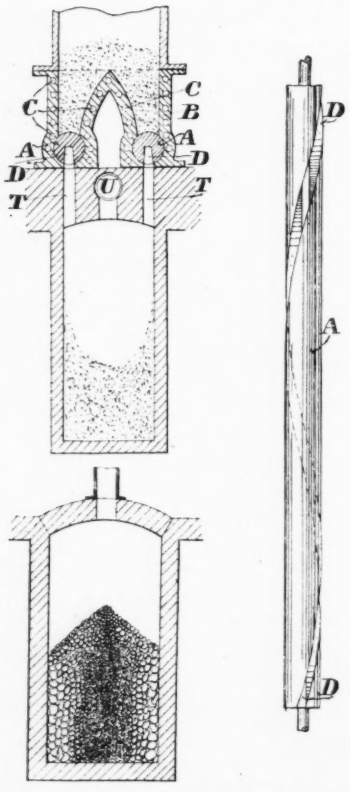
Fig. 1 shows the valve casing and switch, with the valve adapted to be operated pneumatically. Fig. 2 shows a modified arrangement for operating the valve by flexible mechanism for transmitting power in varying directions.

The valve arrangement (which may advantageously be mounted near the burner) comprises the gas-inlet A, passage B leading to the chamber C, the opening from which latter to the outlet-pipe D is controlled by the valve E fixed to, and moved off, its seating F by the valve spindle G. The opposite end of the spindle is fixed to, and is operated by, the flexible diaphragm H, the edge of which latter is firmly secured in an air-tight and gas-tight manner by the screw-plug I with an outwardly extending nipple, on to which is screwed the end of the air-tube K of the pneumatic means for operating the valve. The other end L of this air-tube connects with (say) a flexible pneumatic ball M within the "switch" casing, and operated by the switch arm, the inner end of which is provided with two fingers and adapted to compress the ball by moving the outer end of the arm from left to right, whereupon a spring (which is forced back in compression by one finger of the switch arm when the latter is in the position shown) will follow the other finger and hold the switch arm against the now compressed ball, and thereby maintain the latter, and the air therein, in compression—until the spring is overcome by the operator moving the switch arm back to its normal position, as shown. T is the pilot light, to which gas is constantly supplied by the passage U from the gas-supply chamber.

In fig. 2, the gas-inlet A has a passage or port leading from it to the chamber N, and from the latter another port or passage leads to the outlet D to the burner. Both ports are controlled—*i.e.*, opened or closed simultaneously—by the flexible diaphragm which, in this case, constitutes the valve. This diaphragm O is advantageously formed of a disc of india-rubber, or other flexible and gas-tight material, which is secured around its edge by a screw-plug, as with the diaphragm H in fig. 2. A coiled spring serves to normally keep the diaphragm O in the position shown, so as to prevent the passage of gas from the port N, and so cuts off the main gas supply from the burner. The valve spindle P is attached at one end to the diaphragm, and at the other end to a flexible wire, which passes through tubular casing and is attached at the point Q to a crank-arm on the shank of the turn button R. A spring catch serves as a stop to limit the extent to which the crank-arm can be turned, and an indent in the spring catch serves to retain the end of the crank-arm therein—until it is forced back clear of the detent by the operator turning the button R. Thereupon the action of the spring in the valve casing will return the crank-arm to its normal position, as shown, and will simultaneously return the diaphragm O to its normal position to close the main gas supply to the burner.

Producing Coal Gas.—Busse, P., of Crosta, near Bautzen, Germany. No. 4956; March 9, 1905.

This invention relates to apparatus for producing coal gas, "with the object of assuring a continuous feed of coal and preventing or minimizing alterations in the shape of the device and the expansion of the parts under the influence of heat." It is also designed with a view to lowering, to a certain extent, the temperature of the chamber



and the casing of the feed rollers by means of which the coal is fed to the ovens in a thin film or layer. This is effected by mounting the rollers against the walls of the chamber, in a casing provided with a cooling device, and is an "improvement" on the construction described in patent No. 26,246 of 1904—see "JOURNAL" for Oct. 17, 1905, p. 181.

It further consists in arranging the grooved chambers referred to longitudinally in the chamber rollers, of a spiral form. This enables the coal to be fed continuously, since it is admitted progressively from one end of the chamber to the other, or from one end of the coking-oven to the other; so that the coal is never fed into the full length of the chamber all at once, but sinks gradually down on to the crown of the conical heap. This method of feeding the coal is said to be more favourable, since a constantly uniform amount is fed by the device into the oven during the whole time the roller is making a revolution; and thus the intermittent feeding which characterizes the device described in the earlier specification and other similar devices is avoided.

Sectional elevations of two forms of coke-oven chambers, constructed in accordance with this invention, are given; also a view of one of the feeding rollers.

A convenient form of cooling device is one in which the casing B surrounding the feed rollers A, which are provided with spirally-grooved chambers D, is traversed by a number of cooling passages C, or tubes in which some cooling medium is circulated, are embedded in the casing, whereby a great part of the heat from the rollers, and also of the heat radiated from the retort, is extracted—thus preventing any alteration in the shape of the rollers, which might be due to heat. Passages C are also formed in a central saddle piece inside the casing. Or the cooling tubes, instead of being in the casing, may be within the feed rollers A; the cooling medium being admitted through a stuffing or the like. The feed rollers are situated at the lower part of the casing B, as shown, and they deliver the coal through passages T into a retort; the gas passing out through a series of passages into the conduit U.

Combined with the feeding device is an oven of the form shown in the lower elevation. In this, the chamber of the retort differs from the form described in the 1904 patent, in having upright walls; the coal-feeding passage being arranged in the middle of the roof, so as to render possible the use of coal, the patentee mentions, as raised from the pit. "Such coal consists of a mixture of lumps and small, in which, when heated, the smaller coal is more quickly degasified and cakes together sooner than the lumps; since the heat attacks the smaller fragments of coal more quickly than the larger. Hence, to insure the uniform degasification of the mixture, it is necessary to take care that the larger lumps are heated more strongly than the smaller. This effect is secured by so charging the retort that the finer coal is piled up in the middle of it, while the larger lumps subside against the strongly heated walls. By this arrangement the larger lumps receive the greatest heat, which also more readily concentrates towards the middle of the chamber through the stratum of lump coal than if the small coal were at the sides and the large in the middle."

The application of this method, it is said, furnishes a soft or spongy coke, especially suitable for household use.

Generating Incandescent Light.—Mewes, R., of Berlin. No. 5265; March 13, 1905.

This invention has for its object a further development of the process for generating incandescent gas-light described in patent No. 20,558 of 1904. The innovation consists in not only using hydrogen gas, but also other gaseous or vaporiform or gasifiable combustible materials as combustibles, and, further, in enriching the combustibles, or the air for combustion, or both, with liquid combustibles or incombustible volatile compounds—such as calcium ethyl, calcium methyl, calcium ethylate, magnesium ethyl, silicium ethyl, silicium ethylate, borax ethyl, aluminium ethyl, aluminium ethylate, or other liquids of a similar action—for the purpose of obtaining an incandescent light in which the finely-distributed oxides of calcium, magnesium, silicium, boron, aluminium, or other suitable metals or metalloids replace the gauze-like or solid incandescent mantle or body.

The possibility of making this change in the former process of producing incandescent light is, says the patentee, based on the fact that, according to the results of the spectral analysis, only very small quantities of oxides of metals or metalloids are required for producing an incandescent light similar to the arc light without any incandescent mantle, "so that the formation of clouds, observed when the above-named combustible compounds are burned singly, cannot take place, and no deposits in such quantities that they will become a drawback, can be formed."

In the case of the incombustible or non explosive compounds, the enrichment is best effected by the air for combustion.

In the improved process, the conduits or burner-jets are arranged [but no drawings are given] at suitable angles to each other in the known manner, as only in this way, and according to the shape, number, and inclination of the jets, can certain forms of flames be attained. If the conduits are to run parallel to each other, in order to obtain a compact and handy form of the burner, it will be necessary to bend them near the outlet-opening, so that they are directed towards each other under a certain angle. In this case, the conduits formed by tubes, one inside of the other, could be arranged in the same manner as with Daniell's burners, and only the outlets be made pointing towards each other, like the noses of blast-pipes.

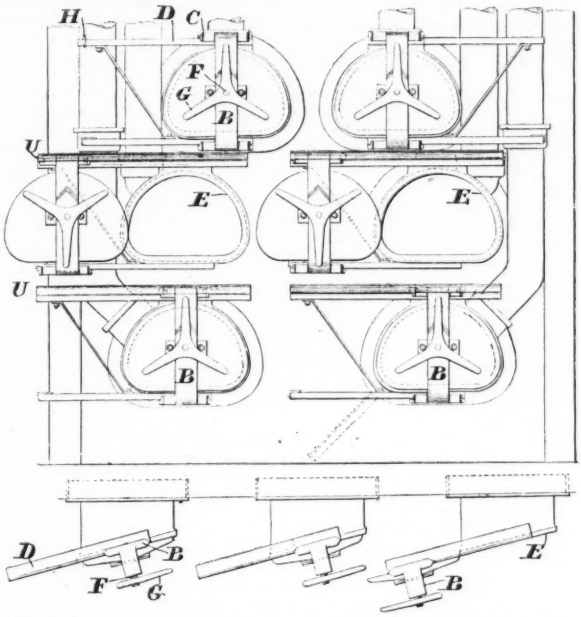
Retort-Lids.—Robert Dempster and Sons, Limited, and Toogood, H. J., of Elland. No. 7791; April 12, 1905.

The patentees claim the formation of the opening of the mouthpiece of a retort at an angle to the plane of the front of the retort-bench; and the application of sliding lids, and the formation of the mouthpieces of the retorts in such manner as to permit of such a lid, when opened, overlapping the adjacent mouthpiece or the open lid of the adjacent mouthpiece. The use of the invention, it is said, enables stoking machines to be brought closer to retorts than is practicable with hinged lids—"thus economizing space and reducing leakage of gas in charging, as the lids can be opened and closed while the machines are in position; moreover, the insides of the lids are always turned inwards and protected from damage, and breakages occasionally resulting from violent swinging of hinged lids will be avoided."

Some photographs and a brief account of the arrangement were

published in the "JOURNAL" for May 16, 1903, p. 429; and to-day a few further details explanatory of the accompanying illustration reproduced from the patent specification may be given.

The elevation of the front of a retort-bench shows the mouths of six retorts, of which two in the middle tier are open. It will be seen that the lids in the upper tier can be slid away from each other or in opposite directions, while in the other tiers all the lids slide to the left—this being, of course, immaterial and dependent upon circumstances. The plan shows three mouthpieces formed at an angle to the front of the retort-bench; one being opened and two closed—all opening to the left.



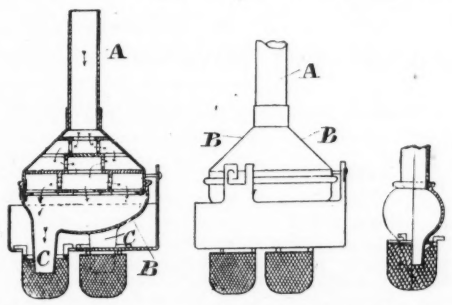
The lids are supported by cross-bars or slides B, which run on rollers C on a rail D; the lids being tightened against the mouthpieces E by screws F, actuated by handles G, and connected to the crossbars, so that the lid is self-sealing. Stops are provided to limit the movements of the crossbars—for instance pegs H, which can be lifted out of the holes in the rails so as to permit of the crossbar and lid being removed for cleaning or other purposes. Lugs may be provided on the crossbar to engage such stops, which stops and lugs may also be provided on the lower guide and the lower part of the crossbar. This lower guide may be hinged, to let up or down, as shown in dotted lines.

The crossbars B may be vertical or inclined, and of any suitable form, as shown; and may be provided with a lug or lugs projecting under the rail D, to prevent swinging or locking in the lower guide. A tar-guard, consisting of a steel sheet U, may be attached to the top of the crossbar B or to the rail D, to prevent tar from the upper retorts dropping on to the lid and connections of the lower one.

Inverted Incandescent Burners.—Helps, G., of Nuneaton. No. 7858; April 13, 1905.

According to this invention, the portion of the burner nearest the inverted mantle is extended in the shape of a bulb, having a capacity much greater than any part of the burner-tube; and at or near this bulbous projection the mantle is fixed. The products of combustion come directly into contact with the chamber and heat up the gas and air mixture before it reaches the point of combustion, and "so the mixture gives a greatly intensified light." In the bulb chamber may be placed discs, cones, or feathers to prevent flashing-back.

One form which the invention may take when applied to a cluster of three mantles is shown. A is the burner-tube, down which the mixture of gas and air descends; and B the bulb or chamber in which the



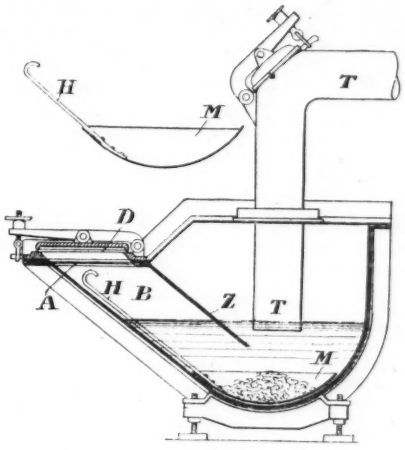
mixing and heating of the gas and air take place. The bulb with the burner-nozzles C may be made in two portions screwed together. There are discs provided to prevent flashing-back. The mantles are carried by a carrier (which forms no part of this invention) having holes in the bottom through which the mantles are dropped; and it is attached by a bayonet joint. The waste products of combustion pass into the annular space formed by the mantle carrier and the bulb, heating up the mixture of gas and air in the bulb.

A half section and half elevation of one form the invention takes when applied to a single burner is also given.

The patentee points out that he is aware that the use of expansion chambers is not in itself novel. They are shown, for example, in the following specifications: Nos. 21,340 of 1895, 17,679* of 1897, 19,061 of 1900, 22,694 of 1900, 22,040 of 1902, 9143 of 1903, 4049 of 1904, and 5086 of 1904.

Hydraulic Mains of Gas-Making Plant for Collecting Pitch therefrom.—Johnson, J. Y.; a communication from the Deutsche Continental Gas-Gesellschaft, of Dessau, Germany. No. 17,464; Aug. 29, 1905.

In the manufacture of illuminating gas, it is pointed out, considerable disturbance and inconvenience is caused by the pitch which collects on the bottom of the hydraulic main being taken along with the warm tar to the outlet, where it accumulates and stops the passage of the tar, and is difficult to remove. This invention is to provide means whereby the disturbance and inconvenience are avoided; and the arrangement is specially applicable to hydraulic mains provided with a longitudinal sealing wall, which forms a separate chamber—the top of the separate chamber being provided with a series of apertures and covers (preferably rectangular) corresponding in number to the retorts. A number of scoops or receptacles (also preferably rectangular) are provided, one of which can be introduced through each aperture in the separate chamber so as to rest on the bottom of the hydraulic main beneath the dipping tubes; and being provided with handles which extend up to near the apertures, when the scoops become filled with pitch they can be withdrawn and replaced by empty ones.



Into the hydraulic main shown, the lower ends of the series of dip-pipes are hermetically sealed with a liquid as usual. Preferably the front wall (on the left) of the main is inclined; and, parallel to it, a sealing wall Z is arranged to extend along the main, and preferably dips a little deeper in the liquid than do the dip-pipes T. Thus a separate inclined chamber B is formed, in the top of which is a series of apertures A, corresponding to the several dip-pipes (or the retorts), and arranged opposite to them. Covers D (of any suitable construction) close the apertures. There is provided a corresponding number of scoops or receptacles M, to be introduced one through each of the apertures A so as to rest on the bottom of the hydraulic mains beneath the respective dip-pipes. Preferably these receptacles are made to fit the bottom of the hydraulic main, and are made so wide as to leave as little space as possible between the sides of adjacent scoops. Each scoop is provided with a handle H, preferably so shaped and disposed that it rests on the inclined wall of the hydraulic main so that it can be readily seized.

During the operation of the gas production, the pitch drips from each pipe T into the respective scoops, and therefore accumulates; while very little, if any, of it passes between the scoops. Thus the pitch is prevented from being taken along with the warm tar to the outlet, and there create stoppage. From time to time the several filled scoops are withdrawn, through the apertures A, and empty scoops put in their place.

Sulphate of Ammonia Manufacturing.—Grossman, J., of Manchester. No. 20,837; Oct. 14, 1905.

On distilling crude ammoniacal liquor for the purpose of manufacturing ammonium sulphate, residual liquors of noxious properties are produced, which (as the patentee points out) are difficult to dispose of; but by saturating the crude liquor with sulphuric acid, and evaporating the solution thus obtained, it is possible to avoid the formation of the objectionable liquors. The solid ammonium sulphate thus obtained is, however, of bad colour, and may be contaminated with ferrocyanides and sulphocyanides.

In order to overcome these and other objectionable features of these methods, he proposes to proceed as follows: The crude liquor is distilled in the usual way in an ammonia still, but without the addition of lime; and the ammonia gas evolved is absorbed in sulphuric acid, in a saturator. The residual liquor from the still is evaporated to nearly the point of crystallization, filtered, and the filtrate transferred to a still (termed the "sulphocyanogen still") made of lead, enamelled iron, earthenware, or other suitable material. Here it is mixed with such an excess of sulphuric acid of from 120° to 170° Twaddel as will, at a proper heat, decompose or drive off all the sulphocyanic acid—the latter, according to the well-known reaction:

$$NH_4CNS + H_2SO_4 = NH_4.HSO_4. + HCNS.$$

The mixture is heated and agitated until of all the volatile compounds which are liberated have been driven off; and these volatile

compounds may be recovered by absorption in suitable materials. The temperature applied in the operation may be slightly higher than 100° C; but it is preferably kept below the point at which a hydrated hydrochloric acid of constant composition might distil over. In this operation, air may be drawn or blown through the sulphocyanogen still and its absorbing attachment.

The liquor, which is now free from sulphocyanides in solution, is run from the sulphocyanogen still into settling tanks, or through suitable filtering apparatus; and the clear liquor thus obtained is placed in the saturator, either by itself or mixed with a further quantity of sulphuric acid, so as to be used for the absorption of further quantities of ammonia gas from the ammonia still. In some cases, it may be preferable not to return it to the saturator, but to neutralize it in a separate plant with ammonia in the form of gas or pure or crude ammonia liquor, and to recover the sulphate of ammonia contained in it, and subsequently formed, by fishing, crystallization, or by evaporation to dryness.

Where the crude ammoniacal liquor is produced on the spot by dry distillation or similar means, only part of the distilled liquor coming from the ammonia still need be concentrated and treated with sulphuric acid; and the rest, after cooling to somewhere about the temperature of the atmosphere, may be used instead of water for the absorption of the crude ammonia gas and the production of crude ammoniacal liquor. The quantity of liquor which in this case has to be evaporated per day will be somewhere equal to the quantity of water produced in the dry distillation of coal or shale out of the water and water-forming constituents which it contains, *plus* water produced by the condensation of the steam used in distilling, *plus* devil water formed, in every twenty-four hours.

If the crude liquor contains appreciable quantities of ferrocyanide, the patentee makes use of the reaction producing insoluble ferrous ferrocyanide—as proposed for the removal of ferrocyanide from coal gas by Foulis, Bueb, and others—in such manner that part of the process in which sulphuric acid is added may be carried on in two stages, as follows: The evaporated liquor is agitated in a separate still with such a quantity of an iron compound (such as sulphate, sulphide, hydrate, carbonate, or the like) as will be sufficient, or barely sufficient, to form ultimately an insoluble compound or double compound with nearly all the ferrocyanide present; and afterwards only sufficient acid is carefully added in such manner as to decompose the thiosulphates present, and to leave a slight excess of free sulphuric acid. After agitating and heating, preferably in a current of air, the liquor is settled or filtered, and the clear liquor transferred to the sulphocyanogen still, in which the rest of the sulphuric acid is added as described above.

APPLICATIONS FOR LETTERS PATENT.

6525.—Incandescent Mill Lighting Company, Ltd., "Incandescent gas-pendants." March 19.
6551.—Palmer, F., "Suction producers." March 19.
6578.—Weide, A., "Burners." March 19.
6594.—Deimel, F., "Gas-igniters." March 19.
6733.—Thompson, J., and Moore, W. G., "Gas-boilers." March 21.
6744.—Hislop, R. F. & J. R., jun., "Inverted globes." March 21.
6761.—Singleton, J. E. E., and Spreadbury, E. L., "Inverted burners." March 21.
6792.—Roessler, A. C., and the Air-Light Company, Ltd., "Adjustable air and gas nipple." March 21.
6793.—Roessler, A. C., and the Air-Light Company, Ltd., "Gas and air combustion systems." March 21.
6794.—Roessler, A. C., and the Air-Light Company, Ltd., "Gas-cock." March 21.
6795.—Roessler, A. C., and the Air-Light Company, Ltd., "Incandescent gas-lamps." March 21.
6796.—Browning, E., and the Air-Light Company, Ltd., "Automatic lighting-device suitable for use in circuits supplying separate gas and air conduits." March 21.
6814.—Terrell, T., "Mantles." March 21.
6828.—Kerpely, A. von, "Gas-generators." March 21.
6863.—Wright, J. W. B., and Darwin, H., "Gas-cookers." March 22.
6876.—Courtis, J. W., "Acetylene-generators." March 22.
6935.—Sepulchre, V., "Gas-generators." March 22.
6945.—Millior, D., "Producing gas by means of hydrocarbons." March 22.
6982.—Lewis, G. P., "Retort-settings." March 23.
6985.—Hudson, E. H., and Sugden, F. C., "Gas-producers." March 23.
7011.—Williams, A. A. V., "Generation of gas." March 23.
7026.—Laberge, E., "Gas-heaters." March 23.
7082.—Smith, R., "Gas iron-stand." March 23.
7115.—Crossley, W. J., and Atkinson, J., "Internal combustion engines." March 24.

Scott-Snell Lamps for Refuge Lighting in Holborn.—At a meeting of the Holborn Borough Council on Wednesday, the Works Committee reported, in connection with the reinstatement of the refuges at the junction of New Oxford Street and High Street, that the Borough Surveyor had suggested that a trial should be made of the Scott-Snell gas lighting. The cost of the lamps is £8 each, against £7 16s. paid for lanterns at present in use in the borough. Each burner consumes 10 cubic feet of gas per hour, which is 1½ cubic feet more than is burnt in the present lamp; but the illuminating power in the new form of lantern being just double that of the old one, more than compensates for the extra gas consumed. The Gaslight and Coke Company had offered to give the Council an opportunity of testing the Scott-Snell system by allowing the free use of six lanterns for three months, on condition that the gas used and the cost of maintenance should be paid. This offer the Committee had accepted. The report was adopted.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill read a second time and committed: Glamorgan and South Wales Water Bill.

Bills reported, with amendments: Accrington District Gas and Water Board Bill, Holyhead Water Bill, Mirfield Gas Bill, North Sussex Gas and Water Bill, Wolstanton Urban District Council Gas Bill.

HOUSE OF COMMONS.

Monday, March 26.

Testing the Indices of Gas-Meters.

Mr. Stephen Collins asked the President of the Board of Trade if he was aware that the Sale of Gas Act, 1859, prescribes the method of testing gas-meters, but makes no provision for testing the indices, though the largest amount of error is likely to arise in them; that the Astronomer-Royal reported to the Treasury in 1860 that this omission rendered the Act nugatory and useless; that a Select Committee of the House reported in favour of amending the Act; that in 1870 the Standards Commission also reported that the Act should be amended and the Board of Trade given power to make regulations, and that the Board of Trade prepared the draft of an amending Bill in 1882; and whether the Board are now prepared to introduce a Bill, or to take any other measures, to remedy the present state of the law as to testing gas-meters.

Mr. Lloyd-George, in reply, admitted that the Act referred to did not specifically lay down the method of testing the indices of gas-meters; but he pointed out that it did require that no meter should be stamped unless it registered correctly within certain limits. He was aware that attention had from time to time been called to the absence of precise directions as to the testing of indices; but he said the Board of Trade had not received any complaint on the point for some years past. He added that he should be happy to look further into the matter, and consider whether any steps might seem necessary to be taken.

[In view of this answer, the Lobby representative of the "Ironmonger" sought an expression of opinion from Mr. W. H. Cowan (one of the Directors of Parkinson and W. & B. Cowan, Limited), the new Liberal member for Guildford. He said he believed the cases in which the index of a gas-meter was defective and caused incorrect registration were of such extremely infrequent occurrence as not to constitute a practical question at all. "But if," continued Mr. Cowan, "there is a public demand for the testing and stamping of the indices by Government authority, then, of course, there would be no technical difficulty in the way. But what could be done in the case of the enormous numbers of gas-meters at present in use? Would it be proposed to call them all in, in order that the indices might be tested and stamped? I hardly think that the persons who from time to time make this suggestion fully realize the magnitude of the work that would be involved if it were carried into effect. If, however, the test were required, it could readily be made. I can understand, from the point of view of the public, that gas consumers wish to be fully assured that the instrument which measures the amount of the gas they pay for is in all respects accurate; and I believe—although I have no authority to speak for them—that, so far as the gas companies are concerned, they would meet such a demand, if it were seriously made, in such a way as to reassure the public."]

The following further progress has been made with Bills:—

Bill read a second time and committed: Wandsworth and Putney Gas (Removal of Sulphur Restrictions) Bill.

Bills reported, with amendments: Bacup Corporation Bill, Cardiff Gas Bill, Carlisle Corporation Bill, Huddersfield Corporation Bill, North-East Lincolnshire Water Bill.

The Poole Water Company having applied for leave to deposit a petition for a Bill, the matter was referred to the Standing Orders Committee, who reported last Tuesday in favour of the permission sought being granted.

WOLSTANTON URBAN DISTRICT COUNCIL GAS BILL.

House of Lords Committee.—Monday, March 26.

(*Before Earl* Cawdor, *Chairman*, *Viscount* Hill, *Lord* Ellenborough, *Lord* Abinger, *and Lord* Northbourne.)

The proceedings in this Bill, which were commenced on the 23rd ult. (see "Journal," Vol. XCIII., p. 870), were resumed to-day.

Mr. Honoratus Lloyd, K.C., and Mr. C. C. Hutchinson appeared for the promoters. Mr. Reader Harris, K.C., represented the Staffordshire County Council; Mr. Wedderburn, K.C., and Mr. Keen, the Newcastle-under-Lyme Corporation; and the Hon. J. D. Fitzgerald, K.C., and Mr. Clease the Burslem Corporation.

Mr. Hutchinson announced that the Committee would not be troubled with the opposition of the Staffordshire County Council, with whom a clause had been agreed.

Mr. Clease then called further evidence on behalf of the Corporation of Burslem.

Mr. *Samuel Johnson*, the Chairman of the Burslem Gas Committee, said he objected to the Bill so far as it affected Burslem, and also as a large ratepayer in Wolstanton. His principal objection to it as a

ratepayer was that he believed they would not be able to supply gas at the same price. With regard to the charges for gas in Burslem, they had made no difference between Burslem and Wolstanton. Their charges were low in comparison with those of other companies and authorities in the district. The Burslem Corporation had always endeavoured to meet the wishes of the Wolstanton customers, both as to charges, pressure, and so on. They had had no complaints from Wolstanton; but, on the other hand, they had been complimented. Their works were in the centre of gas consumption, which meant economy in supply. They had made considerable additions to the works during the past five or six years. As much as 13 to 14 per cent. of their total of 28 million cubic feet went to Wolstanton.

In cross-examination by Mr. HUTCHINSON, witness said that they had a right to make a reasonable profit. Taking into consideration the money that had been spent in extensions, he thought they would agree that, when they were selling good gas at 2s. 6d. per 1000 cubic feet for ordinary purposes and 2s. for street lighting, there was not very much margin of profit. They charged exactly the same in Burslem.

Re-examined by Mr. CLEASE: It was a fact that Parliament gave them power to charge a maximum of 5s. 6d., and they only charged 2s. 6d.

In reply to a MEMBER OF THE COMMITTEE, Mr. Clease said that Burslem paid £80,000 for the undertaking—£36,000 being for works and mains, and £44,000 for goodwill and so on.

Mr. *G. H. Davenport*, a member of the Wolstanton Council, said he was opposed to the Bill. The price charged for gas at present was a reasonable one, both for private and public lighting. Nine out of ten of the ratepayers were against the Bill.

Mr. *R. T. Grocott*, a manufacturer, of Wolstanton, said he feared that the cost of gas would in future be greater than if the Bill were to proceed.

Mr. *W. A. Valon*, said that the works in Chesterton were in bad repair, and supplied a very small quantity of gas. They really wanted dismantling and clearing away entirely. They were not able to supply at the present time even the modest requirements of Chesterton; and they would be no good whatever to the Council. This meant that they would be scrapping £2600. The new site was immediately behind the old one; but it was not well situated. It would mean a permanent expense until they got the railway siding close to the works. The scheme was started with the idea of supplying Chesterton alone. There would be a great length of trunk mains required; and this and other things would not make for economy in the supply of gas. It was impossible to say actually what the cost of gas would be; but it must be much higher than the cost at Burslem or Newcastle. Mr. Woodall had given a figure of £25,000 for the "construction of works, having regard to present consumption and a reasonable increase;" but this would not be sufficient. It would want a very much higher figure. He put it at something over £40,000. He thought it went without saying that the gas would be produced at a dearer rate. He was of opinion that the Local Authority would only be able to supply gas at 9d. per 1000 cubic feet more than it was supplied at now by Burslem (2s. 6d.) and Newcastle-under-Lyme (2s. 10d.). He did not agree with the construction placed upon the Act previously referred to. If Wolstanton wanted anything more than they were entitled to under that Act, they ought to pay for it.

By Mr. KEEN: The Newcastle-under-Lyme works were well equipped and efficient, just as in the case of Burslem. They had modern machinery and appliances for making gas cheaply. The effect on the undertaking would be that it would lose 13 per cent. of its distribution at once. It must increase the cost of supplying gas in their own district. Therefore, if they were only paid for the value of the mains, it would inflict a very heavy loss upon the Newcastle-under-Lyme Corporation. It would also involve a large capital commitment to the new Urban District Council.

In reply to Mr. HUTCHINSON, witness said he could not assume that, if this portion of the district were taken away, Burslem and Newcastle-under-Lyme need charge no more for their gas.

Replying to Mr. WEDDERBURN, witness said he knew of no precedent for such a Bill as this.

Mr. *W. L. Elliott*, J.P., the Chairman of the Gas Committee of the Corporation of Newcastle-under-Lyme, was then called in support of the Newcastle opposition. He considered that the Corporation undertaking would be injured by the Bill.

Mr. LLOYD: Supposing Wolstanton purchased the Newcastle mains, how are you going to supply gas in the Wolstanton district?

Witness: We should lay more mains.

And supposing we bought those under the same powers?—We should lay again.

Replying to further questions by Mr. LLOYD, witness said Wolstanton were trying to put them in a hole by taking away part of their undertaking. He admitted that he had made a speech to the effect that when the interest and sinking fund were paid off, which would be in 25 years, a very large amount would go to the relief of the rates; but he denied that much of this would come from the Wolstanton district.

Mr. *Samuel Wakefield*, the Manager of Messrs. Murray and Co.'s Cotton Mills, said they would not have gas from Chesterton, because they wanted a very steady pressure; and they also feared that the price would be higher.

Mr. WEDDERBURN then addressed the Committee on behalf of the Newcastle-under-Lyme Corporation. He said that the law was that the statutory rights of Newcastle remained. Wolstanton had no statutory rights to supply gas; and they could have none without fresh legislation. He asked why should not their right be taken as a factor in any arbitration that might take place, assuming the Bill was passed?

Mr. LLOYD, in reply, said that the Corporations had much to be thankful for, because they had been benefiting by an outside district, and at the same time they had had an absolutely precarious tenure. He repeated that it was clear that the two Corporations took over the powers on the distinct understanding that they should part (to any Local Authority formed) with the mains, &c., upon the terms specified in those Acts; and they had failed to make out a case of hardship under the Bill.

The Committee found that the preamble of the Bill was proved, and then dealt with the clauses.

CARDIFF GAS BILL.

Unopposed Bill Committee—House of Commons.—Friday, March 30.

(*Mr.* ALFRED EMMOTT, *Chairman of Ways and Means, presiding.*)

A long discussion took place on this Bill, by which it is proposed to confer further powers upon the Cardiff Gaslight and Coke Company.

Mr. SPENCER (Solicitor to the Company) proved the preamble.

Mr. PRITCHARD (Messrs. Sharpe, Parker, Pritchards, Barham, and Lawford) appeared as Agent for the Bill. He said that it was an ordinary Gas Company's Bill. It came before them as unopposed; but petitions were presented against it by the Corporation of Cardiff, and by other Local Authorities, and the Bill had to be amended to meet the objections, and such amendments had been accepted by them as reasonable provisions. The Company had arrived at the end of their capital powers; and one of the main objects of the Bill was to authorize the raising of additional capital. In doing so, they had adopted the practice—the common form—of 5 per cent. stock, which involved the conversion of their existing 10 and 7 per cent. into nominal 5 per cent. stock. They had also reduced their illuminating power from 16 to 14 candles, which was in accordance with the usual practice.

Sir CHANDOS LEIGH said, with regard to the first remark, the Local Government Board had something to say in their report. The Committee had had it in several cases—in Watford, and so on. Though they increased the capital, they reduced the dividend equally.

Mr. PRITCHARD: Quite so. You have it in every existing Gas Company's Bill that comes before you.

Sir CHANDOS LEIGH suggested that the promoters did not want the last part, as to the conversion.

Mr. PRITCHARD said it was pointed out that borrowed moneys authorized by their previous Acts might still be converted into capital. As a matter of fact this was not the case, because all the borrowed moneys had been raised by the issue of debenture stock. This was permanent; and it could not therefore be done. He could not convert his debenture stock into ordinary capital.

Sir CHANDOS LEIGH said he should have argued in Mr. Pritchards' favour, because he could never see why borrowed money should not be converted into capital.

The clauses dealing with the consolidation of shares and stock were then agreed to.

Mr. BEALE (a member of the Committee) raised a point on clause 15, which deals with the raising of additional capital.

To this clause it is proposed to add a new sub-section, as follows: "The Company shall not raise by the issue of preference shares or stock a greater amount of such additional capital than £200,000."

Mr. BEALE suggested that it would be better to make it so much additional capital as will produce £200,000.

Mr. PRITCHARD said it was a Model Clause; and rather than alter such an intricate clause on the spur of the moment, he would ask that he should be allowed to deal with it when the Bill reached the House of Lords.

This course was agreed to.

Clause 19, which has reference to the disposal of stock or shares not sold by auction or tender, was next dealt with.

Sir CHANDOS LEIGH remarked that there was a slight alteration made from the common form.

Mr. PRITCHARD said he had a precedent in the Croydon Gas Act of last session. He had not put in words at the end of sub-section 1, to the effect that shares not sold might be offered to the present shareholders. This was the only way in which it differed from the Model Bill. The words were quite unnecessary, because he had already provided, and the Model Bill provided, that they might be disposed of at the reserve price.

Sir CHANDOS LEIGH: Is that what we have in Croydon?

Mr. PRITCHARD: Yes. It does not affect anybody.

The CHAIRMAN: Will you just explain where it differs exactly?

Mr. PRITCHARD said that clause 19 provided that: "When any stock or shares created under the powers of this Act shall have been offered for sale by auction or tender and not sold, the same may be disposed of by the Directors at a price not less than the reserve price put upon the same for the purpose of sale by auction or tender." The Model Bill went on to say, "or may be offered at such reserve price to the holders of the ordinary shares or ordinary stock of the Company in manner provided," &c. He said that this was useless, because they had already provided that it might be disposed of.

The clause was agreed to.

Sir CHANDOS LEIGH next called attention to clause 34. He said that this was the crucial point, as to the quality of the gas. Originally they had 16 candles?

Mr. PRITCHARD: We have now.

Sir CHANDOS LEIGH asked what they made the power that had actually been given?

Mr. CORBET WOODALL replied that there would be a margin up to 17 candles.

Sir CHANDOS LEIGH: For the last fifteen years we have always given 14 candles; and you do not ask for more now than to assimilate it to the modern practice of 14?

Mr. CORBET WOODALL said that was so.

Sir CHANDOS LEIGH remarked that the Local Government Board said that, under the circumstances, they ought to have a decrease of price.

Mr. PRITCHARD thought they did not go quite as far as that.

Sir CHANDOS LEIGH: What is your price in Cardiff now?

Mr. PRITCHARD: 2s. 9d. per 1000 cubic feet. Since the deposit of the Bill, we have agreed with the Corporation of Cardiff (clause 33a) to reduce the maximum price to the Borough of Cardiff to 3s.

Mr. CORBET WOODALL: That is not a case of a sliding-scale. This is a maximum-price Company; and they are in a position to reduce the price, and are willing to do it.

The clause was agreed to.

Mr. BEALE reverted to clause 23, which says: "The Company may

create and issue debenture stock subject to the provisions of section 18 (debenture stock) of the Act of 1887." He said that the section had nothing whatever to do with the position of the Company after this Act was passed.

Mr. PRITCHARD agreed that this was perfectly true, because they had no more mortgages. He did not know whether it would cause confusion, because it really followed under the other Act.

Mr. BEALE remarked that it implied that they still issued the debenture stock by mortgage.

Mr. PRITCHARD said he always had very great hesitation in altering these financial clauses.

Mr. BEALE said that he thought if the clause came out altogether it would make the Act a good deal clearer.

Mr. Pritchard's suggestion that he should consider the matter, and, if necessary, alter it in the other House, was agreed to.

Clause 39 provides: "If a person requiring a supply of gas for any premises occupies, or has occupied, other premises at which gas is being, or has been, supplied to him by the Company, and has not paid all money due from him to the Company for the supply of gas or for the rent of a meter or fittings, they may refuse to furnish to him a supply of gas until he pays the same."

Mr. PRITCHARD said the only way in which this differed from the Model Clause was this: Under the Model Clause, if a person occupying one house left it without paying his gas bill, and went to another house, the gas company could decline to supply him with gas. Under the clause of the Bill, if a man occupied two houses simultaneously, he could not demand a supply at one unless he paid the gas bill at the other. If he was already supplied at his place of business, and did not pay his gas bill there, he could not come and say: "It is true I have not paid my gas bill there; but I want a supply at my private house." That would not be fair.

The CHAIRMAN said that, as he understood, if a man went from No. 3 to No. 4, under the Model Clause, if he had paid his bill at No. 3 they could be forced to give him gas at No. 4. But if he occupied them simultaneously, and had not paid his gas bill at No. 3, he could not —under the clause of the Bill—demand gas for No. 4.

Mr. PRITCHARD said that if he had a supply at No. 3, and had not paid, and was still occupying No. 3, as well as No. 4, he could not demand a supply for No. 4. "Previously quitted" were the words he wanted to get over. He mentioned as a precedent section 70 of the Brentford Gas Company's Act. There was also another point which his clause dealt with; and that was the non-payment for the supply of gas or for the rent of meters and fittings.

The clause was agreed to.

A third sub-section was added to clause 44—power to sell and lease lands—which reads as follows: "(3) Nothing in this or the last preceding section contained shall authorize anything contrary to the stipulations of any existing lease or agreement."

Sir CHANDOS LEIGH: You want to be put in the same position as a railway company would be as regards land for extraordinary purposes? It was largely before us in Watford, where we allowed it.

Mr. PRITCHARD: Yes.

The clause was allowed; and the Bill was ordered to be reported for third reading.

CORK GAS COMPANY AND THE CORK RAILWAY BILL.

Court of Referees.—Tuesday, March 27.

Mr. CALDWELL presided last Tuesday at a meeting of the Court of Referees of the House of Commons, at which consideration was given to an application by the Cork Gas Consumers' Company for *locus standi* against the Cork City Railway and Works Bill.

The Hon. J. D. Fitzgerald, K.C., at the opening, said that, if the land of the Gas Company was going to be taken, and the Gas Company had alleged that in their petition, they would be entitled to *locus;* but there was no allegation to that effect in the petition.

Mr. LYNDEN MACASSEY, on behalf of the Gas Company, said that his clients' land had been scheduled and shown on the deposited plans, and they had been served with a notice in respect of it. He admitted that the allegation in the petition was not as specific as it might have been; but they did say that their lands might be interfered with. In the Great Eastern case in 1870, in which the facts were almost identical with those in the present instance, the *locus* was allowed.

Mr. FITZGERALD; I say the allegation is not sufficient. You cannot read this petition without seeing that it is not intended to allege that any land is being taken; and the fact that a notice has been served is no ground for *locus*. There is a piece of waste ground which is in the occupation of somebody, but not the Gas Company. Their property is adjoining; and accordingly they have been served with a notice that it may be taken. My instructions are that no part of their land will be taken; but lest there should be any doubt on Standing Orders, notice is given.

Mr. BRYNMOR JONES (a Member of the Court): All the usual consequences of giving notice would apply?

Mr. FITZGERALD: Yes; but what are the usual consequences? This question has nothing to do with *locus standi* at all. If you do not give the owner of land notice, you may have an objection on Standing Orders; and in consequence of that, it is the practice of all promoters to give notices to everyone who by any possibility may have an interest in the land—whether they have or not. It is clear that the Gas Company do not consider any land of theirs is going to be taken. This petition is presented against possible interference with their pipes and mains beneath the street.

Mr. MACASSEY said the land was within the Gas Company's fence, the Company paid rates on it, and it had been referenced as their property.

Mr. FITZGERALD: It is referenced as the property of Miss Mary Reeves, but as being in the occupation of the Gas Company.

Mr. MACASSEY replied that his clients had been served with notice in respect of it. The promoters proposed to construct a new road. The Gas Company were the owners of the subsoil of the proposed road; and they had been referenced and served with notice in respect of it.

Mr. FITZGERALD said names were frequently included in the book of reference merely to avoid questions being raised on Standing Orders. Such inclusion bound no one.

A MEMBER OF THE COURT: That gives you power to take that person's land.

Mr. FITZGERALD, with submission, replied that it did not. The Bill gave power to take the land shown on the deposited plan. The book of reference was for an entirely different purpose. It had been held over and over again that the fact that a name was included in the book of reference was no ground for *locus*.

Mr. MACASSEY pointed out that some of the Gas Company's land was included within the limits shown on the plan.

Mr. FITZGERALD said that was only alleging what they had not alleged in their petition—that some of their land might be taken.

Mr. BRYNMOR JONES: Your objection is simply a technical one—that they omitted to say that some of their land might be taken.

Mr. FITZGERALD said it would be most unfair to him if the allegation was allowed. If the allegation had been made in the petition, he would have been entitled to challenge it and to say that none of their land was going to be taken, which was the instruction he received. How could he challenge the allegation now? If he had done so, the petitioner would have had to give *primâ facie* proof that the land was to be taken.

Lord R. CECIL (a Member of the Court): There is this waste land which I understand it is within your power to take?

Mr. FITZGERALD: That is so.

Lord R. CECIL: Then there are only two questions—first, whether their allegations are sufficient; and then whether the land belongs to them.

Mr. FITZGERALD: Yes.

Lord R. CECIL: Suppose we say the allegation is sufficient, I agree you are entitled to say the land does not belong to them.

Mr. FITZGERALD: Those are my instructions. You see the difficulty I am in. I have no one here from Cork.

Lord R. CECIL: That does not matter, because it is only a question of *primâ facie* proof.

Mr. MACASSEY: I am prepared to give *primâ facie* proof.

Further discussion having taken place, *locus standi* was granted.

UNOPPOSED BILLS.

The Committee of the House of Commons on Unopposed Bills—Mr. ALFRED EMMOTT (Chairman of Ways and Means) in the chair—on Friday held a further sitting.

Carlisle Corporation Bill.

The objects of this Bill are to empower the Corporation of Carlisle to acquire additional lands for the purposes of their Geltsdale Water-Works, to extend the time for the completion of the works, to authorize the Corporation to borrow further moneys for the purposes of their gas and water undertakings, and for other purposes.

Mr. SOUTTAR said that when the Committee last met (see "JOURNAL" for March 27, p. 871) they decided that the term for repayment of moneys borrowed should be sixty years for land, but only fifty years for works; and he had brought up amendments so as to comply with this decision.

The Committee accepted the clauses, and ordered the Bill to be reported for third reading.

North-East Lincolnshire Water Bill.

This Bill provides for the incorporation and for the conferring of powers upon the North-East Lincolnshire Water Company, including the extension of works in Alford and Spilsby.

The Bill was ordered to be reported.

Manchester and the Chorlton Gas Supply.

The transfer of the gas supply in the Chorlton-cum-Hardy district from the Stretford Gas Company to the Manchester Corporation was completed on Monday of last week, when a cheque for over £50,000 changed hands. After the payment of the money, Alderman Gibson, the Chairman of the Gas Committee, accompanied by other members, and by the Superintendent (Mr. Charles Nickson), the Engineer (Mr. James G. Newbigging), the Deputy-Superintendent (Mr. F. A. Price), and the Superintendent of the Street Mains Department (Mr. W. C. Waddington) went to Chorlton, and there they met Mr. Lewis Galloway, Chairman, and several Directors of the Company, including Alderman Sir Bosdin Leech, and Mr. H. Kendrick, the Engineer. Alderman Gibson turned the Manchester gas on at the corner of Wilbraham Road and Barlow Moor Road; and the party then proceeded to Edge Lane, Stretford, where they saw the supply of Stretford gas cut off at the corner of Turnmoss Lane. Before parting, congratulations were exchanged between the parties, on the amicable manner in which the negotiations for the transfer had been conducted.

Oldham Corporation and their Water-Gas Plant.—A few days ago, a deputation consisting of the three representatives of the Hollinwood Ward and members of the Hollinwood Improvement Association waited upon the Oldham Gas Committee, and presented a petition signed by about 330 persons living in the immediate neighbourhood of the Hollinwood Gas-Works, praying that the Committee would desist making water gas at the works, or at any rate use the plant only when absolutely necessary. The Chairman promised that the petition should be placed before his colleagues, and assured the deputation that the Committee were desirous of doing their best to prevent any cause of complaint.

MISCELLANEOUS NEWS.

BRITISH GASLIGHT COMPANY, LIMITED.

The Half-Yearly Meeting of the Company was held last Wednesday, at the London Offices, No. 11, George Yard, Lombard Street, E.C. Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. H. B. Chamberlain) read the notice convening the meeting; and subsequently the Directors' report, and (in accordance with statutory requirement) the Norwich accounts. The report was as follows:—

The Directors submit the half-yearly accounts of the Company to the 31st of December last, as examined and certified by the Auditors, who have also vouched for the correctness of the investments held by the Company.

The available profit is £25,266 19s. 7d., after deducting the following sums—viz., income-tax, £1508 12s.; Hull debenture interest, £2137 10s.; Norwich debenture interest, £1130 10s.; Potteries debenture interest, £665; Trowbridge debenture interest, £166 5s.; interest on debenture stock, £2280—total, £7887 17s.

The available profit, added to the previous balance of profit and loss, amounts to £57,755. From this sum, the Directors recommend a dividend at the rate of 10 per cent. per annum, free of income-tax. This will amount to £24,500, and leave a balance £33,255.

HULL.—The gas-rental shows an increase of £1181, compared with that of the corresponding period of 1904; the price of gas having been the same—viz., 2s. per 1000 cubic feet. Coke shows a decrease of £495; tar and tar distilling, of £391; and ammoniacal liquor and sulphate of ammonia, of £149. Coals have cost 12s. 2d. per ton, as against 12s. 2d. Coke has realized 10s. 8d. per ton, as against 11s. 1d.

The gas sent out was 601,491,000 cubic feet, against 594,805,000 cubic feet in the corresponding period of 1904—an increase of 6,686,000 cubic feet, equal to 1·12 per cent. Of this quantity, 44,967,000 cubic feet was supplied in bulk to the Corporation for the supply of the Old Town.

The profit realized, after writing off £6936 on account of reconstruction of No. 1 retort-house and coal-store, is £4811 less than the parliamentary interest. This sum will be taken from the reserve fund, leaving a balance of £26,718 to the credit of that account.

NORWICH.—The gas-rental shows an increase of £1845, as compared with that of the corresponding period of 1904; the price of gas having been the same—viz., 3s. 3d. per 1000 cubic feet. Coke shows an increase of £414; and tar and ammoniacal liquor, of £461. Coals have cost 15s. 4d. per ton, against 15s. 10d. Coke has realized 7s. 8d. per chaldron, against 8s. 5d. The gas sent out was 247,366,000 cubic feet, against 236,955,000 cubic feet—an increase of 10,411,000 cubic feet, equal to 4·39 per cent.

The profit realized, after writing off £4000 on account of reconstruction of works, is £3892 less than the parliamentary interest.

POTTERIES.—The gas-rental shows a decrease of £490, as compared with that of the corresponding period of 1904; the price of gas having been the same—viz., 2s. 6d. per 1000 cubic feet. Coke shows an increase of £2; tar, of £22; and ammoniacal liquor and sulphate, of £513. Coals have cost 10s. 5d. per ton, against 11s. 4d. Coke has realized 6s. 8d., against 6s. 9d. per ton.

The gas sent out was 202,587,000 cubic feet, against 204,193,000 cubic feet—a decrease of 1,606,000 cubic feet, equal to 0·78 per cent.

The profit realized, after writing off £5000 on account of buildings and plant thrown out of use, is £4101 less than the parliamentary interest. This will be taken from the reserve fund, leaving a balance of £12,616.

TROWBRIDGE.—The gas-rental shows an increase of £125, as compared with that of the corresponding period of 1904; the price of gas having been reduced from the 1st of April, 1905, from 3s. 2d. to 3s. per 1000 cubic feet, with the usual discounts. Coke shows a decrease of £73; and tar, ammoniacal liquor, and sulphate, an increase of £6. Coals have cost 14s. 9d., against 15s. 3d. per ton. Coke realized 8s. 10d., against 10s. 1d. per ton.

The gas sent out was 41,195,000 cubic feet, against 37,779,400 cubic feet—an increase of 3,415,600 cubic feet, equal to 9·04 per cent.

The profit realized, after writing off £234 on account of reconstruction of retort-bench, is £390 less than the parliamentary allowance. This sum will be taken from the reserve fund, leaving a balance of £990.

HOLYWELL.—The gas-rental shows an increase of £146; and residual products, a decrease of £13. The profit realized is £422.

The accounts other than the Norwich having been taken as read,

The CHAIRMAN moved the adoption of the report and accounts. In doing so, he said he would make a few remarks with regard to the accounts and as to the working of the stations during the past six months, as well as upon any points of interest that might have occurred since the closing of the half year. On this occasion, his observations would be directed principally to the accounts, because, in looking over the speeches he had had the honour of making the three previous half years, he found he had dealt at great length with the subject of the new plant and restoration work which had been going on for some considerable period at the principal stations—at Hull, Norwich, and the Potteries. He also thought that the accounts the Directors presented to the shareholders contained many features of interest. First of all, he might congratulate the shareholders upon the general position of the profit and loss account and balance-sheet. The balance which was brought forward from the last account, it would be noticed, was £56,988; and the balance which they had now to deal with was £57,755. They had therefore from this what he might call "rest" to pay their dividend, and would then carry forward an increased balance, by some £700, for the benefit of the working of their stations. This, it must be remembered, was after paying the dividend on the 1500 new shares which the Directors issued last summer for capital purposes. He thought it would be conceded that this was eminently satisfactory. Turning to the profits in detail. At Hull, the profits were £11,248, or £4811 less than the parliamentary interest they were entitled to charge. But they had written off from the profits no less a sum than £6936, so that it would be seen that, if the Directors had not been obliged to write off this amount, they would have had about £2000 in excess of the parliamentary interest. He was glad to be able to report to the shareholders the sum written off on this occasion was the final amount they would be obliged to write off in consequence of the rebuilding of a portion of the works there. He had no hesitation in prophesying that they would have a large balance next half year, either to invest in the reserve (which still stood at Hull at £26,000), or possibly to use in making some reduction in the price of gas to their consumers in the town. While on the subject of Hull, it might be of interest to the shareholders to know that the Directors had at last been able to obtain what had been their wish for a great number of years—a very handsome show-room. The Directors had for many years past been looking out for a proper situation for the purpose. The Board had always had the feeling that they must have, for a show-room, the very best possible site in the town. It was, in his opinion, no good for a gas company to have a show-room up some back street, where the great bulk of the population did not pass. They had therefore been searching for a suitable situation in Hull, and it had only come to them in the past year. The town, which was a very progressive one, had pulled down a great mass of poor buildings in front of the Railway Station, and had driven a broad avenue right through to one of the main streets of Hull; and, in doing so, they had necessarily acquired a certain amount of property. The Company had leased a magnificent shop from the Corporation. The Directors had visited it quite recently, and were thoroughly satisfied they had a splendid site, where everybody was able to see what the Company could do in the way of lighting. It would be of great advantage to the Company; and, in fact, it had been so already. Since it had been open—only at present some four or five months—they had done a considerable business in the place; but, at the same time, they had made arrangements with the local tradesmen so that their feelings and their pockets should not be hurt, and so that the Company could work harmoniously with them and cause no friction with anybody. To return to the accounts, he came to Norwich. At this time last year, the profits were £6541. On this occasion, they were £7456, or very nearly £1000 better than in the corresponding half year. This was the result of the restoration and reorganization of their works at that station. The Company were still considerably under the amount to which they were entitled for their parliamentary interest; but they had not only written off on this occasion £4000 towards the restoration of the works but there were exceptional expenses amounting to £1679 which he trusted would not occur in future half years. So that the real increase in their profits at that station was not represented by £1000, but by nearly £2600. This was also satisfactory. Turning to the credit side of the balance-sheet, the shareholders would see a new item called "Norwich land, St. Martin-at-Palace, £2034." A short story attached to this. Alongside their works at the Palace station, there had been (to the Directors) a sort of Naboth's Vineyard. It was an old rag-mill; and it had been a source of annoyance and danger on many occasions, because they were subjected to the fear of spontaneous combustion, owing to the materials that were stored there. For some years the Directors had been trying to obtain this piece of property without success until now. Sometimes the owners would not sell; at other times, they asked such a prohibitive price that the Board were not able to buy it. At last, however, it came into the market; and the Directors thought it was absolutely necessary for the Company's purposes to purchase the land. They had got it at a reasonable price; and it would be of great assistance to them, both in regard to the enlargement of, and access to, their works. This was included as one of the assets of the parent Company, for which they would charge rent to the Norwich works, because it was not yet scheduled in their Acts of Parliament for the Norwich station. Respecting the Potteries, the same sort of story had to be told of this station that he had been telling about Norwich. In the corresponding six months, the profit was £1602; and for the last half year £3303, or £4101 less than the parliamentary interest to which the Company were entitled. This would be taken from the reserve fund. The Directors had written off £5000, and there had also been exceptional expenses amounting to £640, which showed that, under ordinary circumstances, more than the parliamentary interest would have been earned. Concerning the other two stations—Trowbridge and Holywell—there was very little to remark upon, except that the former was doing exceedingly well; and they would have to increase their plant there, in the shape of new retort-settings, during the coming summer. During last autumn, the Company joined with a number of other companies in the promotion of a Bill in Parliament for the removal of what were called the sulphur restrictions. He was glad to be able to report that from Hull and Norwich there was no petition against the Bill. From the Potteries, however, a petition was presented; but it had been withdrawn after a very friendly interview between the representatives of the Local Authority and the Directors. So that really, so far as the British Gaslight Company were concerned, there was no opposition to the Bill, which he hoped would pass through Parliament in due course. If it did, it would lighten the Directors' anxieties and labours, because at Norwich they were often hard-hit in complying with the conditions that existed at present with regard to the sulphur clauses. He had spoken at considerable length on the accounts; and therefore his remarks, so far as the working of the half year went, would be somewhat shortened. It had not been a very satisfactory half year for gas makers. They had had considerable difficulty with reference to the sale of their bye-products. Coke had been almost a drug in many places; and they had had to lower the price considerably. Tar had also been low, and pitch especially had to be sold at a diminished figure. At the same time, the Company had not their usual increase in the consumption of gas. At Hull, it only amounted to 1·12 per cent.; at Norwich, to 4 per cent.; and at the Potteries, there was even a small decrease, owing to the bad state of trade in the district. But since the turn of the year, things had been looking up; and they had had a satisfactory increase from all the stations. He therefore thought the shareholders could, with confidence, look forward to having as good a year for 1906 as they had had for 1905.

Mr. FRED WILKIN seconded the motion, which was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Major-General CORRIE, the dividend recommended in the report was unanimously declared.

Moved by Mr. ARTHUR BURNEY, and seconded by Mr. B. F. HARRIS, a cordial vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN having made acknowledgment,

Mr. CORBET WOODALL proposed a vote of thanks to the Secretary and the officers and their staffs at the various stations. As the Chairman read out the horrid sequence of deficiency after deficiency right down

the list, he (Mr. Woodall) could not help thinking with sympathy of the officers, who, after working through the half year to achieve excellent results, found that, in London, the profits earned were written down in this deplorable manner. The Chairman, however, had made the position quite clear to the shareholders, and he had no doubt the officers would be satisfied with the explanation. Both in London and at the stations, they had every reason to be pleased with the devotion, and the success attending the work, of their officers.

Mr. L. R. WILKINSON seconded the motion, which was heartily concurred in by the shareholders.

The SECRETARY, on behalf of himself and fellow officers, returned sincere thanks.

OTTOMAN GAS COMPANY, LIMITED.

Record Returns from Private Lighting—The Coal-Tax.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. STEPHENSON ROBERT CLARKE presiding (in the absence of the Chairman, Colonel James Le Geyt Daniell).

The SECRETARY (Mr. T. Guyatt) read the notice convening the meeting and the certificate of the Auditors. The report (which was taken as read) stated that the gas-rental for the half year to Dec. 31 amounted to £14,837; while for the corresponding half of 1904 it was £13,446. The net profit was £3904; and for the last half of the previous year it was £3043. The amount at the credit of profit and loss account was £7079, out of which the Directors recommended the payment of a dividend at the rate of 7 per cent. per annum on both classes of shares. This would leave a balance of £4454 to be carried forward.

The CHAIRMAN remarked that when they met twelve months ago he was in the chair, owing to the unfortunate illness of Colonel Le Geyt Daniell. He was sorry to say that this year the Colonel was again suffering, and had, by the advice of his medical attendant, gone to the South of France. He was, however, pleased to say, and he was sure the shareholders would be pleased to hear, that his health had been much improved by the change; and they would hope to see him with them at their next meeting as well as ever. When presiding last March, he (Mr. Clarke) expressed the hope that the rental, which was then lower, in consequence of the recent reduction in price, would soon be back at its old figure. It had not only attained this, but had surpassed it. The private lighting for the past half year reached the record figure of £10,811, against £9365 for the corresponding half of the previous year, and £10,184 in that of 1903—the year before the reduction in price. To take the various items on the credit side of the revenue account, they had increases this half year of nearly £1400 in gas sold, £400 in bye-products, and about £800 in sundries. The latter item was mostly due to fittings, and was a very hopeful sign for the future. Then, on the other side, to meet the increased business they had carbonized 775 tons more coal, at an additional cost of £780. Depreciation, renewals, &c., stood some £750 higher; the Directors having taken advantage of a good half year to wipe out the suspense account, and extra expense having been incurred in repairs to the purifiers and work on the sea-front. After meeting all charges for the half year, they were left with a balance of £3904. He was pleased to say the prospects of the Company for the next twelve months continued good. They had secured their coal at a very reasonable figure—considerably below current quotations—for the next year. In fact, it was for a little more than this—about fourteen months. If freights were somewhat higher, they were not alarmingly so. They hoped by this time next year to be supplying gas to Cordelio, a favourite and rapidly developing suburb of Smyrna. The general development of Smyrna continued; and the town appeared certain to go on increasing in prosperity and importance. This should conduce to the well-doing of the Company. He concluded by moving the adoption of the report and accounts.

Mr. H. W. ANDREWS seconded the motion; and it was carried.

On the proposition of the CHAIRMAN, seconded by Mr. A. M. PADDON, a dividend for the half year was declared at the rate of 7 per cent. per annum (free of income-tax) on both classes of shares.

The CHAIRMAN moved, and Mr. ANDREWS seconded, the re-election of Mr. Paddon as a Director; and this was agreed to.

The Auditors (Messrs. T. H. Cooke and A. W. Cooper) were then re-appointed, on the proposition of Mr. W. HUGHES, seconded by Mr. F. W. CHURCH.

Mr. COOPER, in briefly returning thanks, said he was pleased to be able to congratulate the shareholders on the excellent state of the accounts.

Mr. A. W. OKE, in moving a vote of thanks to the Chairman and Directors, remarked that it was very satisfactory to see the progress of the Company; and it was also satisfactory to find that the Directors foresaw the probable rise in the price of coal, and secured contracts at a time when rates were favourable to the Company. He hoped that within a little while the tax on the export of coal would be abolished. From what he had seen, he feared it had acted in restraint of trade; and he was sure that undertakings in the position of their own Company would derive benefit if it was abolished.

Mr. T. WILKINS seconded; and the proposal was carried.

The CHAIRMAN, in returning thanks, said he thought they were all agreed with Mr. Oke in desiring the abolition of the tax on coal. It cost the Company about £600 a year, which was a large proportion of their revenue.

Mr. WILKINS proposed a vote of thanks to the officers, for their active services.

The CHAIRMAN, who seconded, said he was sorry to tell them that their energetic Engineer and Manager, Mr. John Gandon, had recently had a very sharp attack of illness; but he was glad to say he was now quite well again. His exertions on behalf of the Company were unremitting; and Mr. Guyatt was equally deserving of thanks.

The vote having been unanimously agreed to,

Mr. GUYATT briefly acknowledged the vote.

RIVER PLATE GAS COMPANY, LIMITED.

In the report that will be submitted at the ninth annual general meeting of this Company on the 12th inst., the Directors state that the accounts for the year ending Dec. 31, 1905, show a profit of £116,295 on the revenue account. To this has to be added a sum of £4639 received from other sources, and £21,083 brought forward; making a total of £142,017. After payment of all fixed charges, making the usual ample allowance for bad and doubtful debts, and providing fully for the upkeep of the works, mains, &c., there is left to be dealt with the sum of £115,651, which the Directors recommend should be appropriated as follows: The interim dividend of 6s. per share (free of income-tax) paid in October last absorbed £30,000; to the reserve fund (raising it to £145,000), £23,429 5s.; to paying a final dividend at the rate of 8s. per share, making 7 per cent. for the year (free of tax), £40,000; to an old age and pension fund, £1000. After these payments, the balance to be carried forward would be £21,222. During the past year, the sum of £19,665 was spent out of revenue on the upkeep of the works and mains, &c., all of which are stated to be in the most efficient order. The total length of mains was increased by 10 miles, bringing it up to 419 miles; and on the date of the balance 2181 new house services were connected with the Company's system. An issue of 14,893 new shares of £10 each has recently been made; and practically all were taken up by the shareholders. The capital of the Company now stands at £1,000,000, fully-paid. The Directors express regret to have to record the loss sustained by the Company through the death, in May last, of the esteemed Chairman of the Local Committee in Buenos Ayres, Don Meliton Panelo, who had been connected with the Company since its inception, and who was formerly President for many years of the old Argentine Gas Company. Mr. F. W. Woodgate, who has been a member of the Local Committee since the commencement, and who has had a lifelong experience of gas business in Buenos Ayres, has been appointed Chairman. The Directors also report with regret that Mr. H. G. Anderson, who had been a much valued member of the Board since the Company was formed, resigned his seat in June last.

THE ACCIDENT AT THE ILFRACOMBE OLD GAS-WORKS.

An inquest was held last Tuesday at Ilfracombe on George Sanders, aged 37, mason, who (as recorded in the "JOURNAL" for the 27th ult., p. 879) was killed during the operation of dismantling a gasholder at the old works of the Ilfracombe Gas Company. The proceedings were watched by Mr. C. E. R. Chanter on behalf of the Company, who were also represented by Mr. R. Lake, the Chairman, and Messrs. W. C. Rafarel and J. P. Ffinch, Directors. There were also present the Inspector of Factories (Mr. H. Shuter), and Mr. R. M. Rowe, the Clerk to the Urban District Council, who have purchased the site of the gas-works. Mr. Seldon appeared on behalf of the widow and family of the deceased.

Richard Passmore, a labourer employed by the Company, said he was assisting in the demolition of the holder. Deceased was on the top knocking away the battens, when one of the principals fell and carried him into the tank, in which there was some 7 or 8 feet of water. Efforts were made to rescue him; but the water was not pumped out until the following morning. Sanders helped a few months go to take down another holder in the same works under the direction of the same foreman. In answer to Mr. Chanter, witness said he had been employed at different places in taking down gasholders, including a very large one at Greenwich. On this occasion, they were following the usual method; but the holder collapsed before they had erected a derrick.

George Luxton, foreman in the employ of the Company, stated that just before the accident he called to Sanders to come off the holder, which he thought unsafe. Deceased replied that he believed it to be safe, but would put in a pole after dinner to support the crown. He made no attempt to get off the holder, but went on knocking out the rafters. The men had been instructed to cut down the principals and let the holder fall into the tank. If this idea had been carried out, it would not have been necessary for anyone to get on the holder. While Sanders was on the roof, other men were cutting away the angle-irons, which would naturally contribute to the buckling of the structure.

By Mr. Shuter: The whole principle on which they were working was wrong.

In answer to Mr. Seldon, witness said that on the Tuesday before the accident he told the men they were to cut away the principals, and none need go on the roof. Though he recognized that the work was dangerous, he was not present while it was being carried out between half-past nine and half-past twelve on Thursday morning.

Mr. Chanter explained that the idea with which the men were working was to strip the holder and take it down piece by piece, as was done in the case of another holder in the same yard. In carrying this out, it was necessary to have a derrick in the middle. Another method of procedure was to cut away the principals and let the holder collapse into the tank, as advocated by the witness.

Witness, in answer to the Jury, said he considered his method the safer, and he knew of no one having told the men to proceed on different lines. He was not always there to prevent them working according to a different plan.

Mr. James Armstrong, the Manager of the gas-works, stated that he could not say really who was in charge of the work of taking down this holder. He was the Manager of the Company, with certain fixed duties; and as he had only been in Ilfracombe a few weeks, he was simply finding out how the whole of the organization was conducted, and had been obliged to let things go on as in the past. A scheme for taking down the holder was suggested by the deceased, who was a mason, and Harry Harris, a blacksmith. Their idea was to take it down piecemeal, as had been done with another holder, removing every other rafter, and leaving intact the rafters which contained the tension-rods. It had been his intention at two o'clock on the day of

the accident to personally superintend the erection of a derrick and wooden structure to facilitate the work and assist in the removal of material. The cause of the collapse was that the men removed six or more consecutive struts, instead of stripping each alternate one, and knocked away the bolts which held the rafters connected directly with the tension-rods and key-post. Who did this, he did not know. On Wednesday afternoon, when he saw them, the men were working according to their own scheme. He was not superintending the work on Thursday morning; and during Luxton's absence there was no one in charge. Sanders and Harris were trusted men, and they had sufficient confidence in them to allow them to go on.

In answer to Mr. Shuter, witness said it would not be part of the scheme for someone to be working round the circumference of the holder while others were on the roof. Had he seen what he knew now of the method of procedure, he should not have approved of it.

By Mr. Seldon: Luxton was general foreman of the gas-works with full control of the men, and was not told off to take charge of this job. The orders Luxton gave for doing the work in a particular way were, of course, superseded by witness's approval of the other method.

Henry Harris, a blacksmith in the employ of the Company, said deceased and himself could not agree with Mr. Luxton's scheme, and proposed their own to Mr. Armstrong, who approved of it. Sanders was knocking away every rafter, and witness told him he was doing wrong, and that he ought to leave sufficient to keep the roof from swaying. No one superintended the work, and no one did anything in opposition to their scheme, except Sanders himself. The scheme which was being carried out was a mixture of their own and Luxton's.

The Coroner, summing up, said it was a case of "too many cooks spoil the broth." There was no one present to see that the scheme was carried out as arranged; and the result was that each man was digging and plucking away at his own particular spot, without anyone to see that too many bolts were not taken away.

The Jury returned a verdict of "Accidental death," and added that the fatality occurred owing to the absence of skilled or any supervision on the part of the Gas Company.

GAS EXHIBITION AT NEWMARKET.

Gas Displacing Electric Light and Domestic Servants.

Ever desirous of keeping the consumers well posted up in the latest types of gas appliances, in order to justify the bold announcement they make in the local papers that gas is the "best domestic servant," the Directors of the Newmarket Gas Company decided on holding a representative exhibition in the Town Hall in the week ending the 24th ult.; and the arrangements were admirably carried out by their Engineer and Secretary, Mr. J. H. Troughton. A capital display of gas cooking and heating stoves was made by Messrs. Fletcher, Russell, and Co.; a special feature being their non-lighting-back burner. John Wright and Eagle Range, Limited, showed gas-fires of the latest makes and also their steam-radiators. The Gas Company themselves exhibited gas lighting and heating appliances of the newest patterns—the former including a variety of incandescent lamps of both the upright and inverted types; and the latter, Wilsons and Mathieson's stoves constructed on their new principle of heating. Ewart's bath geyser and Hutchings's steam-cooker were also on view. Mrs. G. Sutcliffe gave cooking demonstrations every afternoon and evening; one lecture being devoted to invalid cookery. The exhibition was opened by the Chairman of the Company (Mr. R. Stephenson, M.A., J.P.), who stated, in the course of his opening remarks, that the Humphrey incandescent "arc" lamp, eight of which, each of 300-candle power, illuminated the hall at the cost of 2d. per hour, had been adopted by a firm in the town in substitution for the electric light. This is what he prophesied would happen; and he said that his prediction was being fulfilled every day—electric lights being taken out in order that gas "arcs" might be put in. He also stated that Mr. Troughton told him he knew many houses in the town where a servant was formerly kept where none was needed now. The householders had been enabled to dispense with their servant because they used gas for cooking, for warming their rooms, and even for such purposes as ironing their linen.

GAS COMMITTEES AND LOCAL IRONMONGERS.

The Gas and Water Committee of the Ramsgate Corporation discussed on the 20th ult. a memorial recently presented by the local Association of Master Plumbers and Gas-Fitters. A Sub-Committee who had had the matter under consideration reported that, after looking into the propositions submitted by the memorialists, it was unanimously resolved that the Committee were unable, in the interests of the gas undertaking, to recommend them for acceptance by the Gas and Water Committee. They, however, recommended that the following propositions should be submitted for the consideration of the Committee: "(1) That a gas-fitter or ironmonger in the borough of Ramsgate be at liberty to purchase for cash any burner, gas-fitting, cooking-range, gas-fire, radiator, geyser, gas-boiler, or other gas apparatus from the show-rooms of the Gas Department, at a price not exceeding 10 per cent. on the net cost thereof, delivered at the show-rooms. (2) That a gas-fitter or ironmonger in the borough of Ramsgate who sells, or secures a customer to hire, a gas-cooker, gas-fire, radiator, geyser, gas-boiler, or other gas-cooking or heating appliance which the Corporation fix free of cost for a consumer, will be entitled to fix and fit the same on behalf of the Corporation; the cost of providing and laying the necessary gas-pipes to be paid by the Gas Department to the gas-fitter or ironmonger, in accordance with a scheduled price to be fixed by the Committee: Provided always that the work be carried out to the entire satisfaction of the Engineer of the Gas Department, or his duly appointed representative, and that such apparatus does not result in the displacement of apparatus already installed for the use of gas for a like purpose." After a short discussion, the report was adopted.

The Lancaster Town Council at a recent meeting appointed a Committee to consider a letter of the Lancaster and District Ironmongers' Association with respect to the letting on hire and sale of gas-stoves, &c. They have reported that the Corporation do not, nor do they intend to, let out gas fires or radiators on hire; also that the trade in the sale of gas-fires is very small, and in radiators does not exist. They have further resolved that it is inexpedient to alter the present policy of the Gas Department with respect to the sale and hire of gas-cookers and other gas appliances, or with respect to the internal work done in houses by the Gas Department; and that a separate application for gas should be made by any plumber or ironmonger desiring to use the same for the display of lighting, cooking, and heating appliances. These resolutions have been approved by the Gas Committee.

SOUTHAMPTON CORPORATION AND THE GAS COMPANY.

Company's Bill not to be Opposed.

At the Meeting of the Southampton Town Council last Wednesday, Alderman Le Feuvre presented the report of the Parliamentary Committee in regard to the negotiations which had taken place between them and the Gas Company on the subject of the latter's application to Parliament. He said that in their original Bill the Company proposed that they should create a fund of no less than £223,500, under the three heads of a reserve fund, a renewal fund, and an insurance fund, before the ratepayers could demand a reduction in the price of gas in the borough. A clause giving the Company power to raise £44,700 under the head of an insurance fund had been abandoned. Another clause, authorizing them to raise £89,400 as a renewal fund, had also been given up. With regard to the reserve fund, the Company had power to raise money to the extent of 10 per cent. of their capital, which would allow them to create a reserve fund of £89,400. Another clause which would be of considerable advantage to the town was one which provided that the Corporation, as a public authority, should have power to stipulate as regarded the conditions under which gas-mains should be laid on private property. They had this jurisdiction over public roads, but not those on private property, except at the time when the roads were dedicated to the public. They had also had inserted in the Bill a provision that they should have proper and increased supervision over the public roads and bridges in the borough. The result of this agreement was that he asked the Council to adopt the report of the Committee, which recommended that, on the necessary amendments of the Bill being adjusted between the Company's Parliamentary Agents and those of the Town Clerk, the petition against the Bill should be withdrawn. He thought they had cause for satisfaction at what had been done; in any case, a very large amount of expenditure in Parliament had been avoided. They considered the Company also had been judicious in acceding to their request, as they also had been saved a very large amount in expenditure. He proposed the adoption of the report. Alderman Dunsford seconded the proposition, and said every member of the Council would be gratified at the successful negotiations with the Directors of the Company, who had treated them in a very generous manner. They did not ask for more than they felt they were entitled to; but they did ask for more than they obtained. However, the clauses inserted would be an immense advantage to the borough, and he thought the Council were justified in the position they took up in meeting the Directors, and taking the action they did. In reply to a question, Alderman Le Feuvre said that no portion of the borough paid more than 2s. 10d. per 1000 cubic feet for gas. The proposition was carried.

IPSWICH AND THE SULPHUR QUESTION.

At a Special Meeting of the Ipswich Town Council last Wednesday, the Paving and Lighting Committee reported as follows with regard to the Gas Companies (Removal of Sulphur Restrictions) Bill, which they said they had carefully considered:—

Prior to 1883, there had been repeated complaints as to the excessive amount of sulphur compounds (other than sulphuretted hydrogen) in the gas supplied by the Ipswich Gas Company; and, therefore, when the Company went to Parliament in that year for additional powers, the Corporation opposed the Bill as introduced, and asked that clauses might be inserted in the Bill prohibiting, under penalties, the supply of gas containing in the winter months more than 25 grains of sulphur in each 100 cubic feet, or 22 grains in the summer. The Council's application was acceded to; and the clauses were incorporated in the Bill. From 1883 to the present time, the Company have carried on their works under these clauses; and though your Committee have on many occasions found it necessary to complain of the excessive quantity of sulphur compounds in the gas supplied to the public, the Company have succeeded in keeping clear of all liability for penalties, and no prosecution has ever been instituted.

The object and effect of the Bill now before Parliament is to remove the restrictions imposed upon the Company by the clauses inserted at the instance of the Council in the Act of 1883. Your Committee are of opinion that it is extremely undesirable, in the interests of the public, that these restrictions should be removed; and in this view they are supported by the medical profession of Ipswich, for the Hon. Secretary of the Ipswich Clinical Society has forwarded to your Committee the following resolution, which was passed at a meeting of the Society held on March 8, and ordered to be forwarded to the Town Council:—

> "The Ipswich Clinical Society view with alarm the intention of the Ipswich Gas Company to seek parliamentary powers to remove the sulphur restriction clause of the Ipswich Gas Act, 1883, which was inserted to prevent the continuance of the discomfort caused by the excessive sulphur in the gas supplied to the public prior to that date. It is the hope of the Society that the Town Council of Ipswich will oppose the removal of this important safeguard, which means so much for the health and comfort of the inhabitants of Ipswich."

Your Committee are at a loss to understand what induces the Company to seek to change the present position. At the annual meeting of the Company held on Feb. 19 last, the Chairman is reported to have said that it was not a

question of saving cost. He is also reported to have stated that the only method by which the sulphur could be reduced to the limit of the Act of Parliament, was by employing a very noxious and unstable compound; they had to purify with lime. It appears to your Committee that if there is only one known method of purification, and the Company ask that they may be excused from being obliged to use that method, the result will be that the gas will be supplied without being purified from its sulphur compounds. Nevertheless, at the meeting above referred to, the Chairman stated that their action in this matter did not mean that they were going to send out an impure article. Your Committee are unable to follow the reasoning of the Chairman of the Gas Company on this point.

Your Committee hope that if the Council intimate to the Ipswich Gas Company their strong desire that the sulphur restriction clauses should remain as at present, the Company will withdraw Ipswich from the operation of the Bill, and will not force the town to incur the large expense involved in a continued opposition. If, however, the Company do not see their way to withdraw from the present application to Parliament, your Committee beg to ask for the directions of the Council in the matter.

Mr. RAFFE said that he was going to ask rather an unusual thing. A somewhat serious matter was before them in connection with the Gas Company; and he thought they should give the Chairman of the Company an opportunity of replying upon anything that might be said, in order both that their case could be fairly stated and for the information of the Council. He proposed that permission should be given to Alderman Ford Goddard to speak on the matter dealt with in the report. [This was unanimously agreed to.] He then moved the adoption of the report, and consequently the confirmation of the proposal to oppose the Bill; stating that the action taken by the Committee was animated by no ill-feeling towards the Gas Company. On the contrary, there had never been any friction between the two bodies. He admitted that other municipalities had withdrawn their opposition to the Bill in question, but said that this had been done without any report, statistics, or test—without any real evidence, in fact, for or against the sulphur clauses. He quoted figures to show that the sulphur compounds in the gas had increased of late years, and expert and medical opinion to prove that such an undue proportion of sulphur was detrimental to the public health. On behalf of the 8000 consumers living in small houses, in particular, who represented 30,000 inhabitants at least, he submitted that the restrictive clauses should be maintained. The opposition to the Gas Companies Bill might cost the town £500; but the money would be well spent in protecting the townspeople from the effect of these noxious fumes.

Mr. STADDON, as a small gas shareholder, seconded the resolution, and said that the Clinical Society of Ipswich were unanimous in coming to the conclusion that if the clauses were omitted it would be very detrimental to the health of the town.

Alderman D. FORD GODDARD, M.P., then addressed the Council. He prefaced his remarks by saying he had not asked for the permission that had been given; but doubtless there were some technical points upon which the Council might wish to be enlightened. He pointed out that there was very great difficulty in carrying out the purification; but the Company had done their best to fulfil their obligations. He reminded the Council that in 1904 the Board of Trade appointed a Committee of eminent experts to inquire into this question; and they recommended Parliament to do away with the penalty clauses in regard to the sulphur compounds. In carrying out the recommendation, Parliament, in 1905, with the approval of the Board of Trade and the London County Council, relieved the London Gas Companies from this obligation. The Ipswich Gas Company, with fourteen other Companies, were now applying to Parliament for an Act which would give them the same relief. The importance of these clauses had been unduly magnified. From 1860 to 1903, Parliament had granted Acts or Provisional Orders to 470 gas companies and 232 local authorities; and out of these only 51 had any of the sulphur clauses in them. Only two of the local authorities had them. In face of the fact that no action was taken by these 230 local authorities, how could it be said that, if the Ipswich Company were relieved of the restrictions, they would be poisoning the people of the town? He pointed out, moreover, that no fewer than 44,588 million cubic feet of gas were supplied by these local authorities, without any evil results having followed. The clauses were not necessary, as had been proved by the most recent expert evidence. They did a great deal more harm than good, and ought to be done away with. While thanking the Council for having given him a hearing, he must say, in conclusion, that the Company felt a strong objection to the penalty clauses; they could not withdraw from the Bill now, nor would they think it right to do so. They felt convinced that, in the interests of the town, and of the consumers of gas, it was best that the Company should be left a free hand in this matter.

Mr. PRETTY said the gentleman who had just been speaking to them, and explaining the reasons why these restrictive clauses should be withdrawn, was the one who stood responsible for the imposition of the clauses. It was owing to the quality of the gas that he (Alderman Goddard) distributed to the town, that the clauses were inserted in the Company's Act. Prior to that, the gas was so bad that people used to stop away from divine worship in places where it was used; and the firm to which he belonged brought a claim against the Company for damage to goods, which the Company admitted and paid. As Chairman of the Electric Lighting Committee, he was inclined to say to the Company: Send out as much bad gas as ever you like; the worse the better. Then, if the public grumbled about having their goods damaged, their ceilings blacked, and their fittings spoiled, they could be all the more advantageously invited to come to the Corporation for a light which would not do any such damage. He could not see that the Company had made out any case to support the Bill to which they were parties, and urged that they might well be asked to withdraw from its promotion.

Mr. RIDLEY drew attention to the important point that the Council should not commit themselves to the expenditure of some £500 unless there was some prospect that their opposition to the Bill would be successful. He contended that there really was no such prospect.

Mr. RAFFE, in replying upon some of the points raised, said he was informed by the Gas Inspector that if anyone went into a town where the sulphur restrictions were not in force, he would soon find the fact out without being told. As to the assertion that the purifying plant had of itself been a nuisance, he said that not one single complaint to this effect had ever been made from the neighbourhood.

Mr. MOIR suggested that the Council should approach the Directors, and endeavour to come to some arrangement with them.

Mr. RIDLEY said if Mr. Moir would make his amendment that the matter should be referred back to the Paving and Lighting Committee to approach the Company before proceeding with the opposition, he would second it.

The amendment was then carried by 13 votes to 7.

GAS v. ELECTRICITY FOR OXFORD STREET.

Committee Favour Gas.

At the Meeting on Thursday of the Marylebone Borough Council (which some few years ago acquired the local electricity undertaking from a private Company at a cost altogether of about £2,000,000), the Lighting Committee brought up the following report.

The system of incandescent gas lighting for the borough, decided upon by the Council in July, 1903, has now been completed, with the exception of Oxford Street (from Marble Arch to Tottenham Court Road). It will be in the recollection of the Council that it was determined that, having regard to the importance of the thoroughfare, it should be dealt with separately. With a view of ascertaining the most efficient, as well as the most economical, method to be adopted, we invited some of the best-known firms dealing with street lighting to submit schemes and estimates for our consideration, with the result that the Gaslight and Coke Company, Messrs. Pontifex and Co., and Messrs Keith, Blackman, and Co. have complied with our suggestions. Having regard to the fact that the Council's electricity undertaking is now available for the purpose, we requested the Electric Supply Committee to submit a scheme for the lighting of the thoroughfare with electricity, together with an estimate of the lowest possible price that could be charged for the same.

Dealing with the latter proposal first, the estimate for installing, lighting, and maintenance is as follows.

Eighty-one columns to be erected on the footways with the lights about 20 feet from the pavement. Each light guaranteed to give a fixed light of 1500-candle power. This gives an aggregate of 121,500-candle power for the whole thoroughfare. With a view of making the lighting as economical as possible, it is suggested that 45 lamps should burn from lighting-up time till daylight; while the remaining 36 should be switched off at 12.30 a.m. The total estimated cost of installation amounts to £3440, for which sum it is suggested by the Consulting Engineer of the Electric Supply Committee a loan should be raised. The period allowed for the repayment of such a loan appears to be ten years; and providing the money was obtained at 3½ per cent., the annual charge for repayment of loan and interest would amount to £413. In addition to this annual charge, it is estimated the cost for lighting and maintenance would amount to £1785, made up as follows.

Cost of current	£923 12 0
Trimming, repairs, and painting	465 0 0
Carbons, &c.	292 10 0
Contingencies	104 0 0
	£1785 2 0

The most economical scheme of gas lighting in our opinion is that submitted by the Gaslight and Coke Company, and is as follows: To provide and fix 142 footway-lamps and 21 refuge-lamps (on present existing refuges). The type of lamp suggested is cylindrical in shape, which, it is claimed, has the advantage of casting practically no shadows either on roadway or pavement; the two main ribs of the lantern being so placed that such slight shadow as may be thrown follows the line of the kerb. The system recommended is the Scott-Snell self-intensifying system, which is claimed to be most improved type of incandescent gas lighting. The light in the footway-lamps would be 12 feet from the ground. In the refuge-lamps the light would be 15 ft. 6 in. from the level of the refuge. The total maximum candle power given by the whole of the lamps would be 117,200. Of the suggested 142 footway-lamps, those situated at the corners of intersecting streets (34) would give each a maximum of 800-candle power, while 108 would give a maximum of 600-candle power. The refuge-lamps would each give a maximum of 1200-candle power. It is provided that at all street corners the lamps should have transparent street-name tablets affixed thereto. The Company are prepared to enter into a contract with the Council for a period of five years, during which time they will undertake to thoroughly maintain and keep the system in the highest state of efficiency. They also hold themselves liable for any damage to the lamps or fittings by accident or otherwise, and they undertake to paint the lamps and columns with two coats of paint annually. They also agree that the Council shall have power to determine the contract at six months' notice in case of proved negligence or default. The installation is offered to be defrayed for £1566 16s.; while the lighting, extinguishing, and maintenance, in accordance with the above-named conditions, amounts to £1681 8s. 4d. per annum. The cost of gas is calculated at the rate now paid for street lighting.

So as to make a comparison between the two suggested systems, it is necessary to treat the amount of gas installation in the same manner as that suggested by the Consulting Engineer of the Electric Supply Committee for the electric system; and by so doing it appears that—

Electricity will cost	£1785	+	£413	= £2198
Gas	,, 1681	+	188	= 1869

We may point out that in the new rate the Council have agreed to raise the sum of £1600 for installing a new system in Oxford Street and £1900 for maintenance and lighting. Should the Council agree with us and determine not to raise a loan for the installations, the two systems would compare as follows:—

Electricity:	Installation, £3044.	Lighting, &c., £1785.
Gas:	Installation, 1566.	Lighting, &c., 1681.

Having interviewed the Consulting Electrical Engineer and also a representative of the Gas Company on the matter, the Committee have

come to the conclusion that either system will light the thoroughfare effectively; but that as the incandescent gas system is lighted from double the number of points, and the lights are so much nearer the pavement, the lighting of the street will be more evenly diffused and much more effective by this system than by that of electricity. Apart from these considerations, the cost to the borough for gas will be not only considerably less, but will come well within the amount agreed to be levied on the ratepayers for the purpose.

We recommend that the Council adopt the scheme and tender of the Gaslight and Coke Company, and authorize us to enter into the necessary contract with the Company for carrying out the installation and for the maintenance of the system for a period of five years.

The report was placed among the opposed business, and had not been reached when the Council adjourned. A special meeting will probably be convened to consider the matter.

EDINBURGH AND LEITH GAS COMMISSIONERS.

Annual Dinner.

The Commissioners held their Annual Dinner in the North British Station Hotel, Edinburgh, on the evening of Wednesday last. A large company of invited guests sat down, among whom were the following gentlemen from Glasgow: Ex-Bailie Calderwood, the Convener of the Gas Committee, Councillor W. F. Russell, Mr. Alex. Wilson, the Gas Engineer to the Corporation, Mr. Walker, of the Town Clerk's Office, and Mr. A. Russell. Sir ROBERT CRANSTON, the Lord Provost of Edinburgh, presided.

Ex-Bailie CALDERWOOD, in proposing the toast of "The Gas Commissioners," said it was only recently that he had come into touch with this body. Last year they had a visit from the Commissioners to Glasgow, to see their new works at Provan. It was quite a natural thing, seeing that the Edinburgh and Leith Gas Commissioners had gone in so largely for new works, that they should wish to view their new works in the West. The Commissioners were good enough to invite them to visit their works at Granton, which they did. Only one section of them had yet been built—a section capable of producing about 10 million cubic feet of gas per day, which meant that, when the works were completed, they would be able to manufacture some 70 million cubic feet per day. He thought they were very wise to look before them. He commended the Gas Commissioners of Edinburgh and Leith for the great step they had taken in connection with the works. They were men of large ideas, and of large hearts; but there was one who was associated, and could not be dissociated from them, in the carrying out of the works, and that was Mr. Herring, a gentleman of whom he had formed the very highest opinion, both as an Engineer and as Manager of the works. He was also the moving spirit in connection with the regulations for the use of locomotives in gas-works, &c. To Mr. Herring, and to Mr. Jack, the Clerk to the Commissioners, they were very much indebted indeed in this matter.

Judge BRYSON, of Leith, the Convener of the Works Committee of the Commissioners, acknowledged the toast. He said that their gas undertaking was holding its own; and, compared with ten years ago, they were doing very well indeed. Their gross profits had increased from £39,000 in 1896 to £92,000 last year; while the price of gas had been reduced from 3s. 2d. and 3s. to 2s. 9d. per 1000 cubic feet. This was very satisfactory. During that period, the Commissioners had acquired land at Granton, which would serve them for the next fifty or sixty years. They had constructed gas-works there which would be sufficient for the next ten or fifteen years. They had been able to provide the money—over £600,000—to build the works without raising the price of gas or getting one penny of assistance from the rates. The works had really been built out of savings in the cost of manufacture. The £59,000 increase in the gross profits was not the result of cheaper material, as the price of coal was about the same now as it was ten years ago. The result had been brought about by economy of working and good management at the new works. They certainly had a right to claim credit for what had been done, and the public could not be too well informed of the success of the policy of the Commissioners. They might also congratulate themselves upon the success of their purchase of Craigleith Quarry. For the first three months after the pipe was laid and the pump set going, they extracted water from this source to the value of £453; and there was no falling off, but rather an addition, to the volume of water in the quarry. The only other matter he would refer to was what was known as the Granton smells. He could assure them that their Engineer was using all the means at his disposal to minimize the nuisance as much as possible. He did not think the Engineer had got credit in the past for what he had done in this direction. He hoped the residents in the Trinity district would take it as their wish to reduce the smells to a minimum, and that neither time nor money had been spared to bring about this result.

Judge MALLINSON proposed "The Officials."

Mr. W. R. HERRING, in his reply, complained of a fashion which had cropped up, in the Press, within the past few years, of traducing officials' characters as well as their duties, and said he considered it a very bad one for the public service. It could, he said, do no possible good. It must result in self-respecting men either retiring from the public service, or otherwise they would trim their sails to the breeze that was blowing, and sacrifice the public interest in order to obtain the peace and quietness which they could get either by retiring or else by pandering.

Lord Provost CRANSTON said it was detrimental to the public interest when such scurrilous statements were made. He felt for the officials, knowing what he did of them throughout the whole city of Edinburgh; and he would like to see more kindliness extended towards them. He could assure Mr. Herring that he had their sympathy in any remarks which had been made detrimental to the high and honourable position he held.

GAS-WORKS RESULTS IN GERMANY.

Following up the particulars given in last week's "JOURNAL" from the annual report of the German Continental Gas Company, we notice to-day the position of two other Companies that are interested in a number of German gas-works.

The Allgemeine Gas Actien Gesellschaft, of Magdeburg, is apparently more than an investment Company, as might be inferred from its title; for the Directors' report for 1905 refers to the Company's fifteen gas-works, as well as to shares held in the Lorraine-Luxemburg Gas Company. Most of the works are, however, of small dimensions. During the year, the total consumption of gas increased by 6½ per cent.; the advance being general, with the exception of Langensalza. Including the balance brought forward, the accounts show net profits of £20,721, as compared with £18,817 in 1904; and a dividend is proposed at the rate of 7 per cent., being the same as was paid in the previous year. The source of all the coal carbonized at the works may be of interest. It was as follows for the two past years:—

Coal.	1905. Per Cent.	1904. Per Cent.
Westphalian	38·4	49·2
Upper Silesian	17·6	16·6
Lower Silesian	10·4	7·6
English	13·9	10·5
Saar	14·6	14·6
Saxon	5·1	1·5

The Allgemeine Gas und Elektrizitats Gesellschaft, of Bremen, which has a share capital of £150,000, and obligations amounting to £48,000, is an investment Company which was interested in forty undertakings at the end of 1905. The Company participated in a concession offered in regard to the Schandau Gas-Works, by taking over the loan and a large portion of the shares. During the year, the consumption of gas increased in the case of each of the works in which the Company is interested; while at the same time the net profits were higher. After meeting working expenses and interest on obligations, the accounts showed net profits of £10,130 for 1905, as against £9799 in the preceding year; and the Directors proposed to pay a dividend of 4½ per cent., as compared with 4 per cent. in 1904. At the recent meeting of the shareholders, however, a motion was adopted to raise the rate to 6 per cent.

ANTWERP WATER-WORKS COMPANY.

A Serious Accident and Presence of Mind.

The shareholders of this Company assembled for their annual meeting last Friday; and after the Secretary (Mr. J. M. Hamilton) had read the formal notices, the Chairman (Mr. Easton Devonshire) made a speech composed of several matters of interest. Before noticing them, it may be mentioned that the Directors' report showed that the income, from all sources, amounted to £61,281, as compared with £60,284 for 1904; and after deducting working expenses, the cost of laying on services, and London expenses, there was a balance of £40,806. Adding the undivided profit of £4580 brought forward, and interest on investments (£655), made a total credit of £46,042. Against this, had been charged debenture interest and income-tax, the contribution to the reserve account of 5 per cent. on the net profits, the interim dividend of £11,250 (at the rate of 7½ per cent. per annum), the transfer to the sinking fund for redemption of debentures of £1900, and for that of the share capital, £6250, and the Directors' extra remuneration under Article 118 of £1093. The sum of £18,822 was then left, out of which the Directors recommended that a final dividend for the six months to Dec. 31 be paid at the rate of 8½ per cent. per annum, free of income-tax, absorbing £12,750, and making a total dividend of 8 per cent. for the year. A balance of £6072 is carried forward.

In his address, the Chairman referred to the satisfaction he had in presenting such a report. The progress of the Company had been a steady one; and the net result as regarded increased profit was good. The pumping and engine charges showed an increase of some £300. This was due entirely to the starting of the new pumping-station at Luythagen, which had now been running some eight months, during which time they had been working the new plant somewhat irregularly. There had also been an increase in the maintenance charges, which their Manager explained was due to the wet weather they had had in Belgium during the greater part of the year. He (the Chairman) knew, from his own experience, that in the sandy soil of Antwerp the mains would burst. The number of houses supplied showed an increase of 1269 new contracts, or, after deducting voids and changes, a net increase of 1244 over the previous year's total. This was not a record, but it was not far from it. The Company were now supplying 16,000 houses out of, approximately, 40,000; so that there was plenty of room for expansion. There was, however, a falling off both in the meter and town supplies, due to the wet weather. These figures, however, were bound to be variable ones. An exceptional expenditure had been incurred in moving both their trunk mains, at the bidding of the State Railway Authorities, who had built a new line across the road between Waelhem and Antwerp; and the Company had been compelled to take the mains over the bridge. The capital account showed an over-expenditure of £15,298; and probably the Company would have to spend £5000 more during the current year, to bring the Waelhem engines and pumps up to the same capacity as the light service and high-lift plant at Luythagen. It was not proposed, however, to deal with the over-expenditure at the moment, as it was well covered by the general investments. They were, however, going to ask the shareholders to increase the borrowing powers to an amount that would probably last the Company to the end of their concession—25 years hence, if the Municipality did not buy them up in 1911. He then explained the great public improvement works that were now in hand at Antwerp, which would greatly increase the scope for business.

Regarding the new pumping-station at Luythagen, the plant had responded in every way to the expectations of the Directors in respect of its ability and economy. The plant was formally inaugurated last June by a visit of the Governor of Antwerp and some hundred gentlemen, representing the provincial and city authorities, engineering, commerce, and the citizens generally. Doubtless many shareholders had read the reports of the floods at Antwerp on March 12 and 13. The first news that came over stated that the works at Waelhem were flooded, and that the whole supply was cut off. This was quite true so far as Waelhem was concerned; but fortunately the Company had, at the time, the pumping plant and the service reservoir at Luythagen full of water, and they continued the supply by pumping at low pressure from this reserve. He wished to tell the shareholders how well their Manager and staff behaved on the occasion. Without any warning apparently, on March 12, an immense volume of water rushed over the high road facing the Waelhem works. The road was considerably higher than the general level of the works; and the flood came over through the bursting of a dyke. It went through the engineer's cottage and flooded the whole of his dwelling-rooms, rushed on into the lower part of the works, and rose until the water reached the tops of the boilers—a depth of 6 feet. Naturally, pumping was at once stopped; and he thought it was entirely stopped for the first time since the works were opened in 1881. The underground reservoir at Luythagen was fortunately full at the time; and the Engineer-in-Charge (Mr. Burghardt) managed for some hours to keep the supply going from that source. By his presence of mind, Mr. Burghardt undoubtedly saved the Waelhem machinery and works from damage which might well have cost the Company some thousands of pounds, instead of a few hundreds, for repairs. The fires were put out, and the whole of the pumping-engines were stopped. It was necessary to open the intake sluices, which could only be operated by hydraulic pressure; and Mr. Burghardt succeeded in getting the pressure needed by the Luythagen engines pumping back to Waelhem the water in reserve. Mr. Burghardt and his men had to dive into 6 feet of water to get to the taps in order to open the sluices and let the water out on the falling tide. Mr. Kemna, their General Manager, was at the same time doing all he could at the Antwerp end. The Chairman gave further details of this unique accident; and concluded by reading a resolution the Directors had passed recording their great appreciation and admiration of the services rendered by Mr. Kemna, Mr. Burghardt, the staff, and employees generally on this occasion.

The motion for the adoption of the report and accounts, having been seconded by Mr. George Evans, was unanimously carried. The second resolution covered the financial recommendations of the Directors, as given in their report. The Directors' power to borrow was then, by a subsequent resolution, extended from £100,000 to £200,000. The retiring Directors (Mr. George Evans and Mr. John Kennedy) and the Auditors (Messrs. Deloitte, Plender, Griffiths, and Co.) were also re-elected; and the proceedings terminated with the customary complimentary votes.

The Directors of the Swansea Gas Company, after providing £902 for depreciation, and transferring £5000 to reserve, recommend a maximum dividend at the rate of 5 per cent. per annum for the half year ended Dec. 31 last. A balance of £7131 will remain to be carried forward.

METROPOLITAN WATER BOARD.

The Examination of Water.

At the Meeting of the Board on Friday, the Water Examination Committee presented a report with regard to the extension of work at the laboratory. They stated that, in their opinion, it was desirable that research work should be inaugurated as early as possible, with the view, for example, of ascertaining, to a greater degree than is at present practicable, the precise effects of storage and filtration on water. The Committee understood that the Local Government Board desired that the Water Board should undertake what was known as the "combustion process" of chemical examinations instituted by the late Sir Edward Frankland, and continued on behalf of the Government by Dr. Thorpe, the Director of the Government laboratories. Sir William Crookes and Sir James Dewar used this test for the Water Board up to the date of their relinquishment of office; and the Committee learnt that the desire of the Local Government Board was that the result achieved by this process should be compared with those attained by other tests in operation at the Water Board's laboratory. To carry out this process, certain research work, and other investigations, for the purpose of complying with the provisions of section 25 of the Metropolis Water Act, 1902, the Committee recommended that an estimate of £400 on capital account and another of £1456 on revenue account should be approved. Mr. Courthorpe moved, as an amendment, that the recommendation be referred back. Colonel Colvile seconded, and Lord Welby (the Chairman of the Finance Committee) supported it. The amendment was carried by 21 votes to 20.

The Finance Committee presented a report, in the course of which reference was made to the proposed increased expenditure in connection with the examination of water. They expressed the opinion that, in view of the fact that the control of the water undertakings is now in the hands of a public authority, a communication should be addressed to the Local Government Board, asking whether steps could not be taken to relieve the Water Board of the annual payment of £850 in respect of the salary of the Official Water Examiner under the Metropolis Water Act, 1871.

A return for the month of February, giving information relating to the supply of water, was presented by the Works and Stores Committee. It showed that the total of the average daily supplies was 200,935,000 gallons. The number of houses supplied was 1,041,805; while the total estimated population was 6,781,079. The mean supply per head per day amounted to 29·6 gallons, against 30·5 gallons in the corresponding month of last year. The total quantity of water in store in impounding reservoirs at the end of the month was 6677 million gallons; the corresponding figure for 1905 being 7138 million gallons.

DEVONPORT WATER-WORKS PURCHASE.

The stockholders in the Devonport Water-Works Company met on Thursday last and confirmed the agreement provisionally made by the Directors for the transfer of the undertaking to the Corporation. The agreement, which was entered into on March 1, and was signed by

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GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 19.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	21½—22½	..	4 13 4
160,000	10	,,	7½	Do. 7 p.c.	15—16	..	4 13 9
200,000	5	Nov. 15	7	Bombay, Ltd.	6⅞—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	4⅞—5⅛	..	5 6 8
52,000	10	Mch. 9	14	Bourne- mouth Gas & Water	10 p.c.	..	28½—29½	..	4 14 11
51,810	10	,,	7		B 7 p.c.	..	16½—17½	..	4 0 0
53,200	10	,,	6		Pref. 6 p.c.	..	15—16	..	3 15 0
380,000	Stk.	Feb. 22	12½	Brentford Consolidated	262—267	−1	4 13 8
300,000	,,	,,	9½	Do. New	192—197	..	4 16 5
80,000	,,	,,	5	Do. 5 p.c. Pref.	123—128	..	3 16 11
206,250	,,	Dec. 14	4	Do. 4 p.c. Deb.	103—106	..	3 15 6
220,000	Stk.	Mch. 9	11¼	Brighton & Hove Orig.	230—235	..	4 15 9
246,320	,,	,,	8½	Do. A. Ord. Stk.	163—168	..	4 18 3
460,000	20	Sept. 28	10	British	43½—44½	..	4 9 10
100,000	Stk.	Feb 22	6	Bromley, Ord. 5 p.c.	120—123	..	4 17 7
165,700	,,	,,	4½	Do. do. 3½ p.c.	91—94	+1	4 15 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	12½—13	..	5 7 8
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
150,000	20	Mch. 9	8½	Cagliari, Ltd.	23—25	..	6 12 0
100,000	10	Sept. 28	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Oct. 27	4½	Do. 4½ p.c Pref.	10—10½	..	4 5 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
50,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	100—102	..	4 8 3
1,443,280	Stk.	Feb. 22	5⅛	Commercial 4 p.c Stk.	114—116	..	4 9 7
560,000	,,	,,	5	Do. 3½ p.c. do.	111—113	..	4 8 6
475,000	,,	Dec. 14	3	Do. 3 p.c. Deb. Stk.	84—86	..	3 9 9
800,000	Stk.	,,	6½	Continental Union, Ltd.	129—132	..	4 18 6
200,000	,,	,,	7	Do. 7 p c Pref.	143—148	..	4 14 7
432,070	Stk.	Feb.	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	Jan.	4	Do. Deb. Stk.	108—110	..	3 12 9
486,090	10	Jan. 25	11	European, Ltd.	23—24	+½	4 11 8
354,060	10	,,	11	Do. £7 10s. paid	17—18	+½	4 11 8
15,223,235	Stk.	Feb. 8	4⅛	Gas- light and Coke	4 p.c. Ord.	97½—98½	−1	4 9 4
2,600,000	,,	,,	3½		3½ p.c. max.	88—90	..	3 17 9
3,799,735	,,	,,	4		4 p.c. Con. Pref.	108—110	..	3 12 9
4,193,975	,,	Dec. 14	3		3 p.c. Con. Deb.	88—90	..	3 6 8
258,740	Stk.	Mch. 9	5	Hastings & St. L. 3½ p.c.	98—102	..	4 18 0
82,500	,,	,,	6½	Do. do. 5 p.c.	121—124	..	5 4 10
70,000	10	Oct. 13	11	Hongkong & China, Ltd.	20—21	..	5 4 9
3,800,000	Stk.	Nov. 15	10	Imperial Continental	232—234	..	4 5 6
473,600	Stk.	Feb. 8	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2
175,242	Stk.	Mch. 28	6	Lea Bridge Ord. 5 p.c.	121—126*	+1	4 15 3
561,000	Stk.	Feb. 22	10	Liverpool United A	234—236	..	4 4 9
718,100	Stk.	Feb. 22	7	Liverpool United B	167—169	..	4 2 10
306,083	,,	Dec. 29	4	L'rpool Unit'd Deb. Stk.	109—111	..	3 12 1
75,000	5	Dec. 14	5	Malta & Medn., Ltd.	4¼—4⅜	..	5 5 3
560,000	100	Oct. 2	5	Met. of	5 p.c. Deb.	103—105	..	4 15 3
250,000	100	,,	4½	Melbourne	4½ p.c. Deb.	104—106	..	4 4 11
541,920	20	Nov. 15	3½	Monte Video, Ltd.		11⅛—12⅛	..	5 12 0
1,675,892	Stk.	Feb. 22	4½	Newc'tle & G'tesh'd Con.		107—109	+½	4 4 10
406,625	Stk	Dec. 29	3½	Do. 3½ p.c. Deb.		98—100	..	3 10 0
15,000	10	Mch. 9	10	North Middlesex 10 p.c.		19—20	..	5 0 0
52,940	1	,,	7	Do. 7 p.c.		12⅝—13⅜	..	5 3 8
300,000	Stk.	Nov. 30	8	Oriental, Ltd.		150—153	..	5 4 7
600,000	5	Mch. 28	7	Ottoman, Ltd.		6—6½*	+¼	5 7 8
398,490	5	Apl. 28	6	Primitiva Ord.		7—7⅛	..	4 0 0
796,980	5	Jan. 25	5	Do. 5 p.c. Pref.		5⅛—5⅜	..	4 13 0
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.		98—100	..	4 0 0
851,070	10	Oct. 13	7	River Plate Ord.		13—13½	..	5 3 8
300,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.		98—100	..	4 0 0
250,000	10	Mch. 28	8	San Paulo, Ltd.		14—14½*	..	5 8 6
70,000	50	Jan. 2	5	Do. 5 p.c. Deb.		50—52	..	4 16 2
135,000	Stk.	Sept. 14	10	Sheffield A		248—250	..	4 0 0
209,984	,,	,,	10	Do. B		248—250	..	4 0 0
523,498	,,	,,	10	Do. C		248—250	..	4 0 0
126,106	Stk.	Mch. 9	5½	Shrewsbury Ord. 5 p.c.		108—118	..	4 13 3
70,000	10	Sept. 28	10	South African		16—17	..	5 17 8
6,250,000	Stk.	Feb. 22	5⅜	South Met., 4 p.c. Ord.		127—129	−1	4 5 3
1,895,445	,,	Jan. 11	3	Do. 3 p.c. Deb.		88—90	..	3 6 8
575,000	Stk.	Mch. 9	5½	S'th Suburb'n Ord. 5 p.c.		120—123	..	4 9 5
60,000	,,	,,	5	Do. 5 p.c. Pref.		125—130	..	3 16 11
112,533	,,	Jan. 11	5	Do. 5 p.c. Deb. Stk.		132—137	..	3 13 0
502,310	Stk.	Nov. 15	5	Southampton Ord.		109—112	..	4 9 3
120,000	Stk.	Mch. 9	6¼	Tottenham and Edmonton	A 5 p.c.	124—127	..	4 18 5
363,020	,,	,,	4¾		B 3⅜ p.c.	99—102	..	4 13 2
137,500	,,	Dec. 14	4		4 p.c. Deb.	105—107	..	3 14 9
182,380	10	Dec. 29	8	Tuscan, Ltd.		10¼—10⅜	+¼	7 8 10
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.		99—101	..	4 19 0
30,000	Stk.	Feb. 22	7⅜			—	..	—
255,636	,,	,,	6⅞	Wands- worth and	A 5 p.c.	133—136	..	4 11 11
75,000	,,	,,	5⅛		B 3⅜ p.c.	110—113	..	4 16 0
69,416	,,	Dec. 29	3	Putney	C 3⅜ p.c.	82—85	..	3 10 7
745,872	,,	Mch. 9	5⅜		3 p.c. Deb. Stk.	107—109	..	4 14 0
185,000	,,	,,	5	West Ham 5 p.c. Ord.		122—125	+1	4 0 0
193,300	,,	Dec. 29	4	Do. 5 p.c. Pref.		106—109	..	3 13 5
				Do. 4 p.c. Deb. Stk.				

Prices marked * are "Ex. div."

Mr. H. E. Duke, K.C., and Mr. T. Bulteel (Chairman of the Water Company) on behalf of the Company, and by Mr. F. Lowe, the Counsel for the Corporation, and Messrs. E. Blackall (Chairman), W. Hornbrook, and M. Fredman, members of the Water Committee, consisted of seven clauses as follows:—

1. The Umpire shall award that £244,000 as the purchase price of the undertaking.
2. The transfer shall take place on June 30, 1906; and the Corporation shall on that date pay to the Company the amount of the award—such payment to be received in satisfaction of the purchase price, and compensation, and all costs, whether of arbitration or litigation between the parties, except the Umpire's fee for the present series of sittings, which is to be borne in equal shares by the parties.
3. The Company's balances of income in hand at June 30, 1906, to be retained by the Company.
4. The unpaid water-rents at that date to be received by the Corporation for the Company; and other unpaid income at that date to belong to the Company.
5. The unexpended balances of capital of the Company to be transferred by the Company to the Corporation.
6. The sum of £3090 received by the Company from the Corporation of Plymouth, for the Pennycross purchase, to be retained by the Company.
7. The Company and the Corporation to bear in equal shares the cost of the shorthand notes and printing.

In sending to the stockholders notice of the meeting, the Secretary to the Company (Mr. Foster J. Bone) also transmitted a statement of the reasons which had induced the Directors to put an end to the litigation, and enter into the agreement. In this, it was pointed out that the sum in dispute between the Company and the Corporation was £58,203; and its award would depend upon the decision of the Courts of Law as to the rights of the Admiralty in regard to the user of water. The basis upon which the agreement was made was to secure to the Company, in addition to the Arbitrators' provisional award of £209,920, the sum of £29,101 10s. (which was one-half the amount in dispute) together with £5000 on account of the costs already incurred by the Company, and also the balances and revenue in hand and the sum of £3090 referred to in the agreement. The Directors felt that the terms should be accepted, rather than run the risk of losing all the amounts in dispute, and incur further costs, the whole or a portion of which might fall upon the Company.

A meeting is to be held at some future date to consider a scheme for the distribution of the purchase money.

The late Mr. William Moxon, Chairman of the Northampton Gas Company, left estate of the gross value of £48,042; the net personalty amounting to £41,440.

NOTES FROM SCOTLAND.

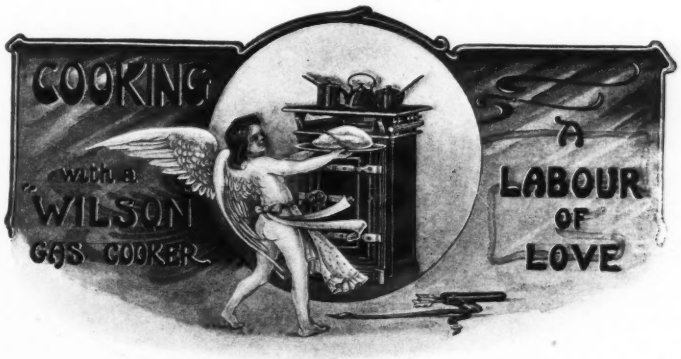
From Our Own Correspondent.

Saturday.

I should naturally begin this week's "Notes" by referring to the dinner of the Edinburgh and Leith Gas Commissioners on Wednesday evening. It was a very brilliant affair in itself; but it was made all the more so by the presence of the gentlemen from Glasgow. The good feeling which has sprung up between the administrators of the gas undertakings in both cities is very pleasant to behold; and the sentiment of ex-Bailie Calderwood, that it may be long before it is cut asunder, will be universally echoed.

There was an incident in the proceedings which I refer to with some hesitation—that is, the remarks of Mr. Herring in replying to the toast of "The Officials." The "Edinburgh Evening Dispatch" has during its whole career, extending to about eighteen years, been notorious for its animosities—sometimes regarded as scurrilities. The gas supply of Edinburgh has been the principal object of attack; but it has not been confined to this, for a few months ago an article headed "Some Strange Disclosures" was published regarding the Musselburgh Gas Company, a full list of whose shareholders was given. What purpose was supposed to be served by this unwonted proceeding it passes the wit of those who have got beyond the dense stage to conceive. Equally unmeaning was the attack which has been made upon the Edinburgh and Leith gas administration. Mr. Herring spoke with some feeling. It is not to be wondered at that he did so, because everyone who knows what he has done since he came to Scotland is convinced that he deserves support, and not the reverse; for his endeavour has always been in the direction of perfecting the gas supply.

That which brought the matter under notice on the evening of Wednesday was the publication, on the afternoon of that day—as if the time had been selected—of a report of a meeting of a Sub-Committee, held on Monday, at which the question of the emoluments of the officials of the Commission was considered. The Clerk had prepared a memorandum upon the subject. The terms of this document, or rather the amount of information it conveyed, did not satisfy some of the Sub-Committee, with the result that Mr. Herring and Mr. Jack, the Clerk, have been asked to answer a series of questions, some of them highly impertinent, with regard to the moneys received by them outwith their salaries. Even the items which made up the charges of the deputations to London in connection with the regulations for the use of locomotives on sidings are called for—in fact, the officials are being treated, not as gentlemen, but as serfs, who are to have no mind of their own, nor any independence. The Commissioners, as a whole, are sound business people, and deprecate the goings-on of a very small section of their body, who have several times shown a disposition to act in sympathy with the newspaper. What was published on Wednesday was only the doings of a Sub-Committee—perhaps only of a section of the Sub-Committee—with local colour added. When the matter comes before the Commission, it may bear an entirely different aspect.



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The ceremony on Thursday of the inauguration of the reconstructed gas-works at Gourock was a happy one for all concerned. A lovely spring day made everything look its best, both inside and outside the works; thereby adding pleasure to a ceremony which could not have failed, in any event, to be interesting. Both in their neatness and design and their manifest utility the works are another testimony to the capabilities of Mr. J. M'Gilchrist, of Dumbarton, in the designing of gas-works for towns of moderate size. It is matter of regret that the late Manager—Mr. J. M'Ewen—did not live to see the completion of the new works, the erection of which was begun under his *régime*. [A description of the works will be found on p. 24.]

It is announced that the lighting scheme for the town of Kelty, in Fifeshire, has been completed; the streets being now all lighted by gas. The new gas-works, the cost of which has been about £7000, have been designed and erected by Mr. R. S. Carlow, of Perth.

A report by Lord Provost Cuthbert and Mr. W. B M'Lusky, the Engineer and Manager of the Perth Corporation Gas-Works, upon the application made by the Gas Workers and General Labourers' Union, on behalf of the employees in the gas-works, for higher pay and longer holidays, has been printed and circulated among the members of the Gas Committee. In the report, it is stated that the request of the Union is for a rate of 6½d. per hour for coal-breaking attendants and coke wheelers, and 7½d. per hour for stokers, which, if granted, would increase the wages of the second stokers by 8d., and of the coal and coke men by 10d. per week. The conditions of labour in Perth are better than those prevailing in Glasgow and Edinburgh. The Union had petitioned for an hourly rate of wages; and it was believed they expected pay for 56 hours per week. The following rate of wages for a 56-hour week is recommended: Head stokers, 8d. per hour—37s. 4d. per week; first and second chargers, 7½d. per hour—35s. per week; first and second drawers, 7d. per hour—32s. 8d. per week; and coal and coke men and producer attendants, 6½d. per hour—30s. 4d. per week. It is also recommended that seven days' holidays, with pay, be given yearly, and that, in addition, men working on New Year's Day receive double pay. Should it be resolved to continue the present scale of sick pay, it is suggested that it should only come into operation when the employees have been off duty for ten days. It is added that returns from various gas-works show that the employees in Perth receive higher wages and have more holidays than those in any other gas-works in Scotland, and that only in Perth is there an established system of sick pay.

The formation of a railway siding into the Hamilton Corporation Gas-Works formed the subject of discussion at a special meeting of the Town Council, called by requisition of eight members of the Council, on Monday last. The requisitionists proposed for consideration, first, that a resolution to proceed, arrived at on March 13, be rescinded; and, second, that a plebiscite of the ratepayers of the Second Ward, in which the siding will be situated, be taken—the Council to abide by the result of the vote. Provost Keith ruled the first proposal to be incompetent, the rescinding of a resolution requiring notice to be given, which had not been done. The situation was accepted, and a long discussion took place upon the second proposal. The arguments on both sides were chiefly directed to the question of amenity, and the danger which the working of the siding would entail upon the community, particularly upon children passing to and from school. A number of the speakers objected to a question of so much importance being decided by the ratepayers of one ward. It was ultimately agreed, by a large majority, that a plebiscite of the ratepayers of the whole burgh be taken.

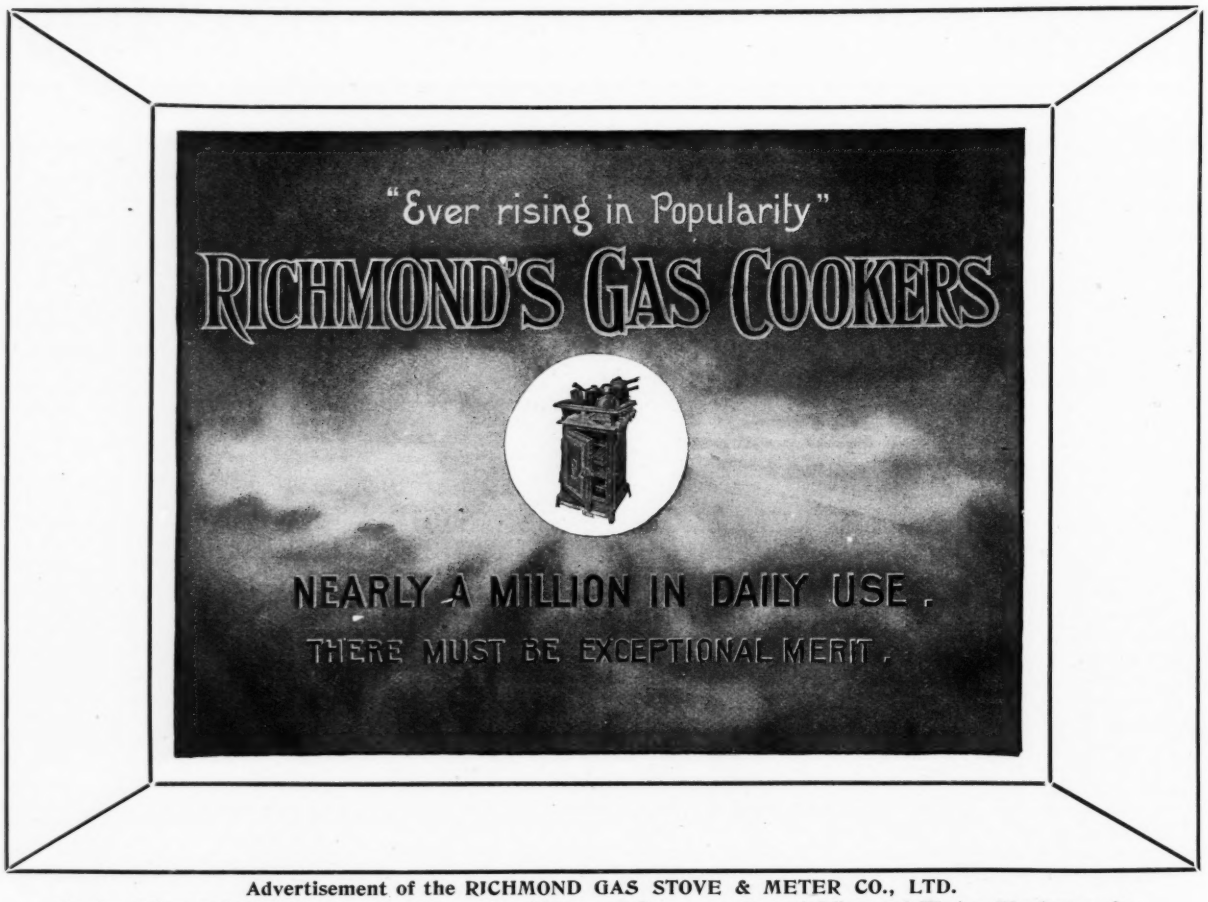
At Lockerbie, on Thursday night, the Town Council considered a further report by Mr. J. M'Gilchrist, of Dumbarton, upon the condition of the gas-works. Judge Henderson, the Convener of the Gas Committee, proposed that they proceed with the alterations according to the scheme prepared by their Manager—Mr. R. W. Cowie—and modified by Mr. M'Gilchrist, and that the work be carried out by Mr. Cowie, with the assistance of a draughtsman. Mr. Scott moved that consideration of the matter be delayed for a month. After discussion, it was agreed that there was no alternative but to proceed with the work; the details being remitted to a Committee to consider and report upon to the Council.

Mr. A. Yuill, the Gas Engineer and Manager to the Corporation of Dundee, delivered a lecture upon "Gas: Its Manufacture, and the Various Purposes to which it Can be Applied," under the auspices of the Lochee Citizens' Association, in the Weavers' Hall, Lochee, on Tuesday evening. There was a crowded audience, who frequently applauded the lecturer. The processes of manufacture, purification, and testing were described; and then the lecturer mentioned the various purposes to which gas could be applied. The lecture was illustrated by some interesting experiments, diagrams, and limelight views.

The Doune Gas Company last year earned a profit of £134. They have paid a dividend of 5 per cent., with a bonus of 2½ per cent., have written £64 off capital and stock accounts, and carried forward £30.

West's Stoking Machinery at Beckton.

The Directors of the Gaslight and Coke Company have decided to extend West's system of compressed-air stoking machinery into the No. 2 retort-house, which is being re-modelled at the present time on similar lines to the No. 3 house, an illustration of which appeared in our last issue. They have, therefore, placed a contract with West's Gas Improvement Company, Limited, for a complete installation of machinery, comprising four sets of coal breakers, elevators, and conveyors, eight storage hoppers, two charging-machines, two combined discharging and drawing machines, automatic hose gear, air-compressor, &c. Each line of coal-handling machinery is to be driven by a separate gas-engine; and the latter is to be placed outside the coal-stores, and connected to the coal breaker and elevator by shafting and gearing. When this house is completed, the Nos. 1, 2, 3, 4, and 12 retort-houses at these works will be operated entirely by West's machinery.



Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.
London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington, &c.

CURRENT SALES OF GAS PRODUCTS.

Week ending March 31.

During the past week, the London market for tar products has been quiet. Inquiries for large quantities of pitch continue to be received; but makers are firm in their views, and have declined an offer of 29s. net at works. Toluol, 90 per cent., has been done at 1s. 1d. net, and is very scarce. Benzol and carbolic acid are unaltered. Pending the decision as to nitrate, sulphate of ammonia remains inactive; the quotation on Beckton terms being £12 10s. firm for prompt.

LIVERPOOL, *March* 31.

Sulphate of Ammonia.

Throughout the week the market has been quiet but fairly steady, the quotations at the close being £12 5s. per ton. f.o b. Hull, £12 6s 3d. to £12 7s. 6d. per ton f.o.b. Liverpool, and £12 10s. per ton f.o.b. Leith. New business has been extremely scarce, but requirements to cover March contracts have been about sufficient to absorb current production and to prevent a decline in prices. In the forward position, the attitude of makers and buyers is unchanged. While makers are holding for a premium, buyers will only purchase in quantity at a discount on prompt prices. Consequently, large inquiries for the East which have been on the market for several weeks have so far not resulted in business. Severe weather has rather checked home consumption as well as that on the Continent.

Nitrate of Soda.

This article is firm in all positions, and spot prices are maintained at 11s. 3d. and 11s. 6d. per cwt. for ordinary and refined qualities respectively.

LONDON, *March* 31.

Tar Products.

Business still remains in a depressed state. Pitch is quiet, and very few sales have taken place during the past week. Business is reported on the west coast at 25s. for a small quantity; while 27s. has again been accepted on the east coast. So far as London is concerned, no transactions are reported, though it is probable that some of the makers would entertain an offer at 28s. A little business has been doing in South Wales, but for forward delivery, and at low prices; and the slight demand which existed for prompt a little while back has apparently ceased for the time being. The stoppage of the strike in the North of France does not appear to have improved the outlook. Anthracene is still inactive, as makers refuse to accept anything like the prices offered. Toluol continues in fair demand at from 1s. 0½d. to 1s. 1d. per gallon. Solvent naphtha remains steady at about 1s. to 1s. 1½d. according to quality, while small quantities of very fine 95 per cent. are reported to have been done at even better than the latter price. Carbolic acid is firm, and business is reported at 1s. 9½d. to 1s. 10d. for 60's, according to port, while there is still a demand for 75's; but makers are not willing to accept the prices offered. Crystals remain unchanged. In creosote, the London market is firm, some makers being practically sold out; but one or two parcels of country oil have been offered for delivery in London at reasonable prices. In the North, the market remains unchanged, and there is no business of importance to record. There has been rather more demand for 90 per cent. benzol, though at low prices. Business is reported in London for March-June at 9½d.; while refiners in the North of England are reported to have accepted even lower prices.

The average values during the week were: Tar, 17s. to 21s. Pitch, London, 28s.; east coast, 26s. 6d. to 27s.; west coast, 24s. 6d. to 25s. Benzol, 90 per cent., 9½d.; 50-90 per cent., 10½d. to 10⅝d. Toluol, 1s. 0½d. to 1s. 1d. Crude naphtha, 4¼d.; solvent naphtha, 1s. to 1s. 1½d.; heavy naphtha, 11d. to 1s. Creosote, London, 1⅞d.; North, 1⅜d. to 1 7/16d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 1s. 9½d. to 1s. 10d. Refined naphthalene, £4 10s. to £8; salts, 20s. to 21s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market remains in about the same position, and there do not appear to be any quantities of importance offering; while buyers seem disposed to await the result of the Nitrate Conference. Beckton still ask £12 12s. 6d.; but second-hand parcels have changed hands at £12 10s. In Hull, the market is quiet; but there is practically nothing offering, and the price remains about £12 5s. The market in Leith appears firm, and it is reported that a small quantity has actually been sold at £12 10s.; but the bulk of the makers are out of the market for prompt. Sales are reported in Liverpool at from £12 5s. to £12 7s. 6d., according to quality; but no business of importance appears to have been done.

The Bryan Donkin Company, Limited.—Supplementing the notice of the reconstruction of this Chesterfield firm that appeared in the "JOURNAL" last week, we are asked to point out that the new Company's principal work will continue to be, as hitherto, the manufacture of gas-exhausting plant, gas-valves, and other gas machinery. Mr. H. J. Donkin will act as London Director, and Messrs. George Clark and Alfred George Webb as Local Directors at Chesterfield, under powers committed to them respectively by the Board of Directors. The Chairman of the new Company is Mr. G. H. Shipley.

Water-Rates at Radcliffe.—The Radcliffe and District Property Owners' Association are dissatisfied with their water charges. The Radcliffe rates being wholly compounded causes property-owners to pay 2d. per house per quarter more than those at Bury, Ramsbottom, and Whitefield, where the rates are only partially compounded. The discontinuance of discounts formerly allowed by the Bury and District Joint Water Board has led to deferred payments followed by threats to "cut off the water," if not paid. The Board's loss for the year ended March 31, 1905, is estimated at from £11,000 to £12,000.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
Blackburn	1,250,000	Buffalo, N.Y.	2,000,000	Newcastle-on-Tyne	1,800,000
Windsor St. Works, Birmingham	2,000,000	Winnipeg, Man.	500,000	Leeds	1,800,000
Saltley Works, Birmingham	2,000,000	Colchester (Second Contract)	300,000	Malton	150,000
Colchester	300,000	York	750,000	Smethwick	500,000
Birkenhead	2,250,000	Rochester	500,000	Gravesend	300,000
Swindon (New Swindon Gas Co.)	120,000	Kingston, Ont.	300,000	Pernambuco, Brazil	125,000
Saltley, Birmingham (Second Contract)	2,000,000	Crystal Palace District	2,000,000	Duluth, (Second Contract)	300,000
Windsor St., Birmingham (Second Contract)	2,000,000	Duluth, Minn.	300,000	Leicester (Second Contract)	1,000,000
Halifax	1,000,000	Caterham	150,000	Newport (Second Conttract)	250,000
Toronto	250,000	Leicester	2,000,000	Brockville	250,000
Ottawa	250,000	Enschede, Holland	150,000	Toronto (Third Contract)	750,000
Lindsay (Remodelled)	125,000	Buenos Ayres (River Plate Co.)	700,000	Montreal, Ont. (Second Con.)	1,800,000
Montreal	500,000	Burnley	1,500,000	Toronto (Fourth Contract)	1,000,000
Toronto (2nd Cont., Remodelled)	2,000,000	Kingston-on-Thames	1,750,000	Hamilton, Ont.	400,000
Belleville	250,000	Accrington	500,000	Rochester (Third Contract)	1,600,000
Ottawa (Second Contract)	250,000	Tonbridge	300,000	Leeds (Second Contract)	900,000
Brantford (Remodelled)	200,000	Stretford	500,000	Buenos Ayres (Primitiva Co.)	1,200,000
St. Catherines (Remodelled)	250,000	Oldbury	300,000	Buenos Ayres (New Co.)	1,200,000
Kingston, Pa.	125,000	Todmorden	500,000	Christchurch, N.Z.	300,000
Peterborough, Ont.	250,000	Saltley, Birmingham (Third Contract)	2,000,000	Rochdale	1,600,000
Wilkesbarre, Pa.	750,000	York (Second Contract)	750,000	St. John's, Newfoundland	250,000
St. Catherines (Second Cont.)	250,000	Rochester (Second Contract)	500,000	Brantford (Second Contract)	400,000
		Newport (Mon.)	250,000	Smethwick (Second Contract)	500,000
		Tokio, Japan	1,000,000	Pontypridd	250,000
				Montreal (Third Contract)	1,800,000

And, in addition, COAL GAS PLANTS at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Trade continues steady in all sections. While the demand for house varieties is still in the ascendant, prices show no variation. With slack and engine fuel generally prices have a hardening tendency; and the feeling is general that a rise in slack will soon be declared. As the summer advances, slack will be a decreasing commodity at the pits. Coal for shipping has been rather better of late. Besides cargoes for the Isle of Man and Ireland, a vessel laden with coal has been dispatched from the Ship Canal for the Continent. The strike of colliers in France is gradually extending inquiries to other coalfields, including South Wales, South Yorkshire, and Newcastle districts. Indirectly, Lancashire is beginning to feel its effects, though only in a slight degree. A new coal seam, 5 to 6 feet in thickness, has been struck near the Old Quay House in the Wirral Peninsula. The long-continued strike at the Pemberton pits, at which over 2000 men have been affected, has been settled. The Coal Conciliation Board met in London on Thursday. The result of the meeting is that no further steps in reference to an advance in wages will be taken until more information has been secured which will show that an advance is justifiable. The South Yorkshire Associated Coalowners have not yet come to terms with most of the great railway companies for their annual contracts. The Midland and some other companies declined to give an advance of 3d. per ton asked for at the beginning of the year; but the coalowners have remained firm. The North-Eastern Railway Company are paying 8s. 6d. per ton for supplies over the year. This was the price asked for from the Great Northern and the Great Central Companies, who offered 8s. 3d.; but it was not accepted. The Midland and Lancashire Railway Companies are purchasing coal from firms outside the area of the Associated Collieries, and it is believed are paying a slight advance on last year's rates.

Northern Coal Trade.

The falling off in the demand for coal for France to normal needs has had some effect on the market; and as the stormy weather had caused some delay in the arrival of steamers, the prices fell off. This was most apparent in the steam coal trade, in which the previous advance had been more marked. Best Northumbrian steams were quoted at about 11s. per ton f.o.b., second-class steams at 10s., and steam smalls are firm at from 6s. to 7s. Work is fairly full at the collieries; but prices vary from day to day, according to the rumours of trouble in collieries in other countries, which might greatly affect the prices here. In the gas coal trade, there is a good inquiry generally; and for occasional cargoes, the prices vary from about 9s. to 10s. 3d. per ton f.o.b., according to the quality of the coal, and the time of the delivery. More of the large home contracts have been entered on. Good Durham gas coals have been sold at prices above those of the contracts that they succeed by some 9d. per ton; while for one or two of the very best kinds, it appears that 1s. advance has been agreed upon. Other contracts, including the largest, are now in close negotiation; but it seems probable that they will be decided much on the lines that have been above hinted at. Coke is rather quiet; but the lessened output steadies prices of both furnace coke and gas coke. Good gas coke has been quoted at 10s. 6d. f.o.b. in the Tyne; but higher figures are also named.

Scotch Coal Trade.

Trade is improving, in the sense that there is more volume of it, and inquiries are keeping up. Prices are not yet quotably higher, but there is an expectation that they soon will be. One or two contracts for gas-works have been fixed; the owners of which, being early, have been fortunate enough to get their supplies for next year at last year's prices. As a consequence of this, and of other owners of gas-works being in the market, the demand for all gas-making coal is keener than for some time. The prices given are: Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 8s. 9d. to 10s., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 278,565 tons—an increase of 58,035 tons upon the preceding week, and of 84,548 tons upon the same week of last year. For the year to date, the total shipments have been 2,693,763 tons—an increase of 187,710 tons upon the corresponding period of 1905.

Reduction in Price at Prescot.—At the annual meeting of the Prescot Gas Company, the Chairman (Mr. Henry Cross) said that there had been an increase in the quantity of gas sold by nearly 2½ per cent. During the past year, a new gasholder and tank had been erected at a cost of £3000, and alterations had been made in the carbonizing apparatus. A water-gas plant to make 150,000 cubic feet per day had also been installed, and was working successfully. There had been an increase in the number of consumers; and the total now was 1829. A reduction of 1d. per 1000 cubic feet in the price of gas had been announced to take place from the 1st inst.; and a small sized cooker would in future be fixed free with all "slot" meters. The net profit for the year was £1456; and the full statutory dividends were declared.

Cheaper Gas at Cromer.—The report adopted at the annual meeting of the Cromer Gas Company stated that the increase in the sale of gas which was apparent in the last quarter of 1904 continued through 1905; the receipts for that year having exceeded those of 1904 by upwards of 3 per cent. The Directors decided to reduce the price of gas to 4s. per 1000 cubic feet on and after Jan. 1 last, from which date the special discount was discontinued. The Board recommended a dividend at the rate of 2½ per cent. per annum, less income-tax. Reference was made to the resignation of the Manager, Mr. J. K. Frost, and the appointment in his place of the Works Manager, Mr. W. H. Archer. A vote of thanks was accorded to the Chairman and Directors, on the proposition of Mr. Church, seconded by the Consulting Engineer to the Company (Mr. Percy Griffith).

NEW CONVEYOR COMPANY, LTD.,

Transport Appliance Works,

SMETHWICK, BIRMINGHAM.

COMPLETE INSTALLATIONS OF RETORTS.

COMPLETE COAL CRUSHING, ELEVATING, AND CONVEYING PLANTS.

COMPLETE HOT & COLD COKE CONVEYING, CRUSHING, AND SCREENING PLANTS.

PLEASE WRITE FOR ESTIMATES.

Telegrams: Aptitude, Birmingham." **Telephone: 50 Smethwick.**

Sale of Shares.—The Portsmouth Water Company's shares continue to maintain their value; 20 shares of £5 each in the 1898 issue, with interest of 5 per cent. per annum, having been sold last week at £6 2s. 6d. per share. Fifteen £10 shares (£5 10s. paid) in the Portsmouth Water-Fittings Company realized £14 each.

Sulphate of Ammonia in Germany.—The annual report of the German Sales Association shows a large increase in deliveries last year, notwithstanding the four weeks' stoppage of production through the coal strike in February. The total reached 102,488 tons of sulphate, against 82,702 tons in 1904; 7703 tons of concentrated liquor, against 5896 tons; and 21,950 tons of weak liquor, against 18,993 tons. Exports amounted to 25,000 tons, and imports to 48,005 tons (practically all from the United Kingdom), compared with 35,165 tons in 1905.

The Rateable Value of London.—A return has been prepared by the London County Council from the valuation lists, showing the total valuation of the Administrative County of London, which, subject to appeals, will come into force on the 6th inst. The totals of the lists are as follows: Gross value, £52,928,707; rateable value, £43,486,436; assessable value—that is, the rateable value reduced by one-half of the rateable value of agricultural land, £43,477,771. The increases in valuation over the figures in force on April 6, 1905, shown by the return are: Gross value, £2,490,054, or 4·94 per cent.; rateable value, £1,829,370, or 4·39 per cent.; and assessable value, £1,830,461, or 4·40 per cent. The total increase is less by £322,996 than that at the last quinquennial valuation, at which, however, it was abormally large.

Water Supply of Liss.—The authorities and the inhabitants of the parish of Liss, near Petersfield, Hants, are at variance on the public supply of water. The Rural District Council on Thursday adopted a high-pressure scheme; but the same evening a parish meeting scouted the idea of any fresh supply at all being required, and said that if any alteration should be carried out a low-pressure scheme would be sufficient. The latter was supported by Mr. W. Radford, of Nottingham, whose estimate for a supply by gravitation was only £2750. This would provide all that was likely to be required for several years. The voting for the low-pressure supply was 91 to 1; and the Local Government Board are to be petitioned to hold an inquiry on the point as to whether or not the parish requires any different supply to that now in existence.

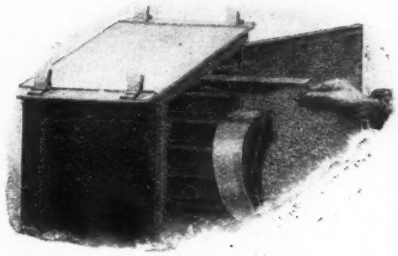
An Advantage to Birmingham from the Welsh Water.—At the annual meeting of Southall Bros. and Barclay, the Chairman (Mr. T. Barclay), speaking of the Elan water supply, remarked that when the scheme for getting Welsh water to Birmingham was brought under the notice of the burgesses, it was stated, among other things, that, owing to the softness of the moorland water, there would be a saving in soap to the consumers approximating in value to £35,000 per annum. This was looked upon by many as an incredible story. It would therefore be interesting, not only to the shareholders of the Company, but to the public generally, in verification of this statement, to learn that at the Saltley mills of the Company, where a considerable quantity of water was required in some of the processes of manufacture, through the substitution of the soft Elan water for the old town supply, there had been an actual saving in soap, during the past year, of 4 tons, which in money value, calculated at £25 per ton, amounted to £100. This was, of course, a clear saving, and well illustrated the advantage of an unlimited supply of soft water for developing the industries of the town and district.

Yorktown and Blackwater Gas Company.—The annual general meeting of this Company was held on Thursday—Mr. A. H. Claypole, J.P., in the chair. The Directors reported that, after paying all charges and placing £160 to the renewal fund, there was a balance of £2335, with which they recommended the payment of dividends at the rates of 10 and 7 per cent. In moving the adoption of the report, the Chairman said the Company had had an uneventful but satisfactory year. The make of gas had been 7 per cent. in excess of 1904; and the balance carried to the profit and loss account was £2335, compared with £1559. Mr. Kitt congratulated the Directors on the report, which he said reflected great credit on the management. The report was adopted. A hearty vote of thanks having been accorded to the officials, it was acknowledged by the Secretary (Mr. S. Rowe) and also by the Manager (Mr. J. Meiklejohn). The latter remarked that last year there was a wild rumour about the electric light, which always caused some of the shareholders uneasiness; but if they looked at the papers they would see that electric light was going down, and that in London gas was being substituted for it for street lighting. This sort of thing was going on all round them. Tradesmen who had electric light found that it was very expensive.

Gas Explosion at Exeter.—For some time reports have been made to the Exeter City Council and to the Gas Company that gas was apparently escaping from the mains laid underneath the new steel girder bridge which spans the River Exe, and was constructed at a cost of several thousand pounds, from designs by Sir John Wolfe Barry; but the leakage, if leakage there were, could not be traced. Shortly before midnight on Saturday, a man crossing the bridge threw away a lighted match. It had scarcely reached the ground before there was a loud explosion, which ripped up the pavement for twenty yards, and was followed by a flare of gas which illuminated the river and precincts for some distance. No one was injured by the explosion. The whole supply of gas for lighting the city has to be taken from the works under this bridge, which also carries electric cables, electric wires, telephone wires, and water-mains; and the vibration of the bridge with the constant traffic over it (including a ten minutes' service of tramways), is believed to have injuriously affected the gas-mains and caused the leakage. The Gas Company are conducting a thorough investigation into the explosion, and will seek the best expert advice in order to avoid a repetition of Saturday night's occurrence. At the time the bridge was built a good deal of criticism arose as to its ability to properly support the mains and wires proposed to be stretched across the river at that point. The City Surveyor, however, expressed his entire confidence in the carrying capacity of the bridge and the method of laying to be adopted.

THE
PARKINSON
"CROWN" COOKER
EMBODIES MANY IMPORTANT IMPROVEMENTS.

HINGED HOT-PLATE.



SLIDING MEAT-HOOK.

SELF-LOCKING GRID SHELF.

PARKINSON AND W. & B. COWAN, LTD.,
(*Parkinson Branch*),
COTTAGE LANE, CITY ROAD, LONDON.
BELL BARN ROAD, BIRMINGHAM.

Reduction in Price at Rochester.—As the result of a conference between the Directors of the Rochester, Chatham, and Strood Gas Company and the respective Corporations, the Board agreed to reduce the price of gas from 3s. to 2s. 9d. per 1000 cubic feet, and to make other concessions. The Corporations, on their part, consented to withdraw their opposition to the Company's Bill.

Kensington Public Lighting.—The Kensington and Knightsbridge Electric Lighting Company recently offered to substitute arc lamps for incandescent gas-lamps in the principal thoroughfares of South Kensington; but the offer has been declined by the Council, notwithstanding the Council's Lighting Engineer estimated that the change would mean a saving of £100 annually, and the illuminating power would equal 54,000 candles, against the present 14,000-candle power.

Electric Light Failures.—Last Sunday week, during the service at St. Martin's Church, Worcester, the electric light failed; and except for two candles on the altar, the church was in darkness. Nevertheless, the incident was not allowed to interfere with the service. The following day, much alarm was caused among users of electricity at Whitley Bay. Suddenly the consumers observed there was an extra strong pressure; and a few seconds later many of the lamps were shattered. Afterwards places of business were plunged in darkness, causing considerable inconvenience.

Water Power for Generating Electricity in Sweden.—The Swedish Government have, according to Reuter's Agency, introduced a Bill in Parliament authorizing a grant for the purchase of waterfalls belonging to private persons, with a view to utilizing them for supplying power for the State electric railways. It is further proposed to empower the Government to expend a sum not exceeding £277,000 to purchase such waterfalls as may be considered necessary for working the State Railways in the immediate future, and the purchase of which cannot be delayed without detriment to the State.

Reduction in Price at Brentwood.—Mr. S. Ray, the Chairman of the Brentwood Gas Company, at the recent annual meeting, complimented the shareholders on the prosperity of the undertaking, and upon the fact that they were paying 9 per cent. dividend, which was 1 per cent. more than they had been able to pay for the past five years; while about £200 more than in 1904 had been carried forward. He said the Directors had decided to reduce the price of gas from 3s. 9d. to 3s. 7d. per 1000 cubic feet. He hoped this would result in a great increase in the consumption for cooking purposes.

Malvern Water Supply.—Lady Grey, the wife of Sir Henry Foley Grey, the Chairman of the Malvern Urban District Council, last Thursday inaugurated the additional water supply which has been obtained for the town. The boreholes and pumping-station are situated about nine miles from Malvern, and the water (obtained from the red sandstone, and of exceptional purity) is conveyed in pipes to the British Camp, where it passes into the reservoirs. The total cost of the scheme was £20,000; and it has been carried out within seven months of the time of the Royal Assent being given to the Act of Parliament authorizing the works. The ceremony at the British Camp was preceded by a public luncheon at the Imperial Hotel.

Serious Gas Explosions.—Taking a light in order to search for a gas leak met with the customary success when essayed by Mr. Everett, of Middlesbrough. The front door of the house was blown to the other side of the street, most of the windows were shattered, and the curtains were ignited. The fire caused a good deal of damage to the furniture; but the flames were extinguished before the arrival of the fire-brigade. Mr. Everett was found to be suffering from burns on the head, neck, and both arms; and he was conveyed to the North Riding Infirmary. Mrs. Everett, who accompanied her husband in his search for the leakage, was slightly burnt. A like fate overtook the Rev. D. J. Williams, Pastor of the Memorial Congregational Church, Portmadoc, who, perceiving a strong smell of gas, lit a match, with the object of testing the burners. The consequent explosion terribly burnt Mr. Williams on the face and hands; while the door was blown away from the woodwork, and the windows smashed. Mrs. Williams, who was behind her husband, was also burnt on the face and hand.

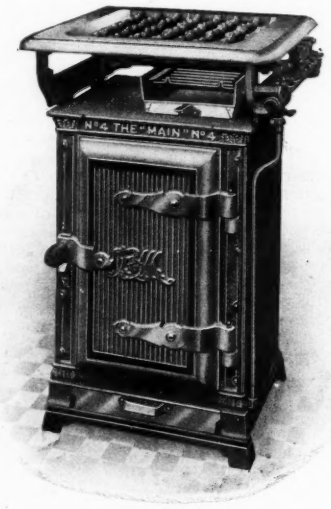
Exmouth Gas Company.—The report submitted to the annual meeting of the Exmouth Gas Company on Tuesday last stated that the mains had been extended in several parts of the town during the past year. There had been a good average increase of consumers, both ordinary and automatic; and the make of gas had increased by 1,757,300 cubic feet, equal to 6·7 per cent. The profit and loss account showed a balance available for dividends of £3830. Payment of the usual dividends would absorb £850, leaving a balance of £2980 to be carried forward to pay the interest on the debenture stock, &c. The Chairman (Mr. J. Palmer) said that since he first became a Director, twenty years ago, the number of consumers had increased from about 400 to 2000, with a corresponding growth in the consumption of gas. The state of the coal market and the price they were paying made it inadvisable at present to reduce the price. The Directors were authorized to sell by auction £1000 of additional 4 per cent. debenture stock, for the purpose of extending the mains and other works.

Monte Video Water Company, Limited.—The ordinary general meeting of this Company was held last Wednesday, at the London Offices, Moorgate Street—Mr. James Anderson (the Chairman) presiding. In moving the adoption of the report, which was noticed in the "JOURNAL" for the 20th ult., the Chairman said the result of the past year's operations must be regarded as very satisfactory. There had been an increase in gross revenue of £5786; while the working expenses showed a slight decrease. Monte Video was constantly extending, and the Company were always ready to lay fresh mains in districts where a reasonable return on the outlay was likely to be obtained. They did not as yet supply much more than half the number of houses; and they were in the position of being able to add largely to the number of customers without adding to their distributing system in the city, though the pumping machinery and mains would soon have to be augmented. Having given particulars in regard to the negotiations for the purchase of the undertaking by the Municipality, he said the price named was regarded as excessive, and the matter had come to an end. The report was adopted unanimously.

The "MAIN"

Gas

Cooker



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R. & A. MAIN, LIMITED,

LONDON, GLASGOW, FALKIRK, BRISTOL, MANCHESTER,

BIRMINGHAM, AND BELFAST

Dorking Gas Company.—The half-yearly general meeting of this Company was held last Tuesday—Mr. H. Young in the chair. In their report, the Directors stated that the accounts for the six months ending Dec. 31 showed, after providing for the interest on the debenture stock and mortgage, a balance of £1409 available for distribution. They therefore recommended the payment of dividends at the rate of 6 per cent. on the "A," "B," and "C" shares, and at the rate of 5 per cent. on the "D" shares. This would absorb £1265, and leave a balance of £144 to be carried forward. The sale of gas showed a slight increase; and the manufacturing operations had been satisfactory. In moving the adoption of the report, the Chairman said there had been a slight increase in the sale of gas in the half year which had enabled them to earn exactly the same amount as in the corresponding six months of 1904. Mr. Budgen, seconding the motion, said they could have wished for a better result of their labours for the past two half years. He thought the whole secret of the matter was that the Company was overburdened with capital; and under the circumstances, were not equal to earning dividend. The Manager (Mr. S. Carpenter) pointed out that the reduction in the price of gas came in with the reduction of profits—eighteen months ago. Mr. Budgen said although he could quite understand that, with electricity as a competitor, they found it well to reduce the price of gas, evidently the Company was not in a position to do it. The motion was carried unanimously. In acknowledging a vote of thanks to the Directors and officials, the Chairman said he thought they were all agreed that they had too much capital; but he did not see any means of curtailing it until they came to more prosperous times for the revenue. People were a little more economical than formerly in the consumption of gas. The Company had a very keen competitor, because that competitor supplied the whole town at once. In a twelvemonth, electric mains were laid in all the streets—a condition of things which they did not find in some of the large towns.

An exhibition of the gas-cooking and heating appliances of Messrs. R. & A. Main, Limited, was held in the Gamble Institute at Gourock last week. Miss E. M. Dods, of the Dundee School of Cookery, was the demonstrator. It was stated at the opening ceremony on Monday that the Corporation were prepared to lay pipes and connect the stoves free of charge, and that they had already booked a large number of orders.

The wide scope of the business of Messrs. Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees, is effectively shown in the new catalogue of gas-works plant which they are now issuing. Since the production of the first and second editions in 1887 and 1892, many changes have occurred which have necessitated revision. The results of this work are embodied in the book under notice. In its 236 artistically printed pages, gas plant of every kind, from holders to service-pipes, is shown. The contents are arranged in nine sections, each preceded by some useful introductory matter; and there are four pages of a general index, so that particulars as to any piece of apparatus can easily be found. In compiling the catalogue, an endeavour has been made to supply information that will be of interest and assistance to intending purchasers, and in every way help them to specify their exact requirements. It is explained that the illustrations, which are numerous, are only intended to give a general idea of the range, in class, type, and size, of work manufactured. It only remains to say that the book is a highly creditable specimen of typography and colour printing.

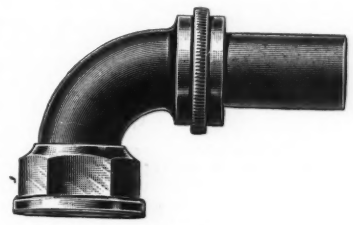
In another part of the "JOURNAL" will be found a notice of the Mid-Oxfordshire Gaslight and Coke Company, Limited, which has been formed for the purpose of amalgamating, and placing under one management, various gas undertakings in the county of Oxford which have hitherto been carried on separately. The share capital is £50,000, divided equally into preference shares (5½ per cent.) and ordinary shares, all of the nominal value of £10 apiece. Applications are now invited for 2000 of each class of shares, as well as for £15,000 of 5 per cent. debenture stock (part of an authorized issue of £25,000), redeemable at 7½ per cent. premium in five years, or on six months' notice from the Company. The present issue is for the purpose of providing the necessary capital to complete the purchase of several gas undertakings, and to carry out certain improvements and enlargements, so as to bring the works and mains up to date; to introduce the general use of slot meters, cookers, and gas-stoves; to improve the public and private lighting; and to defray the expenses of the Company's application to Parliament in the present session. The subscription list will close on or before Monday next.

The fourth ordinary general meeting of the New Inverted Incandescent Gas-Lamp Company, Limited, was held at Winchester House, E.C., last Thursday—Mr. Eli Hinton (the Chairman) presiding. In the report presented by the Directors, they stated that the net trading profit in London, after allowing for depreciation and all trade charges, was £8548. During the year, the business carried on at the Company's branch in New York, inclusive of the United States and Canadian patents, had been disposed of. After deducting £1617, expenses incurred in connection therewith, there was a sum to the credit of the Company on this account of £967, which had been written off the patents account. After making adjustments, the balance of profit amounted to £7275, which, added to the sum of £10,575 brought forward from the previous year, gave a total available profit of £17,850. Out of this, £1032 had also been written off the patents account; and from the balance the Directors recommended the payment of a dividend at the rate of 5 per cent., free of income-tax, which would absorb £3964, and leave £12,854 to be carried forward. The amount due to trade creditors and on sundry accounts on Dec. 31, 1905, had all been paid off since that date. The Chairman, in moving the adoption of the report, remarked that though a large amount had been paid on account of litigation, and the Company had had to face ever-increasing competition, the past year's working had been attended by satisfactory results, as shown by the accounts. He gave particulars of the Company's operations, and said they hoped shortly to produce an improved burner. The report was adopted, and the dividend recommended was declared.

SAWER & PURVES

Stove Fittings.

STOVE BEND.



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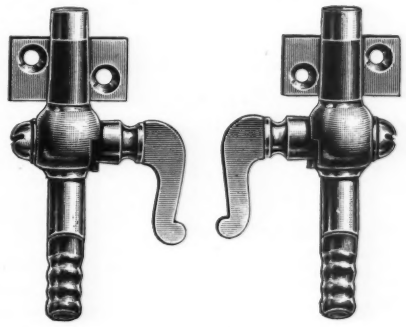
WING HOB TAPS.



No. 114.

STOVE TAP.

No. 110.

SAWER & PURVES,

MANCHESTER & NOTTINGHAM.

The Directors of the Imperial Continental Gas Association recommend a dividend of 5 per cent. for the six months ended Dec. 31 last, tax free.

The Barry Gas and Water Committee have decided to apply to the Local Government Board for sanction to borrow £1600 for new retort-settings.

The Richmond Gas Stove and Meter Company, Limited, held last Friday the half-yearly conference of their representatives at the Warrington offices—Mr. H. M. Thornton presiding. The representatives were entertained to a dinner in the evening.

The report which was adopted at the third annual general meeting of Bruce Peebles and Co., Limited, last Wednesday, stated that the net trading profit for the year to Dec. 31, after providing for depreciation and all necessary charges in connection with the management of the business, amounted to £43,142. After deducting the Directors' and Managing Directors' remuneration and the Auditors' fees, interest on debentures, and income-tax, there was a balance of £36,431, to which had to be added £3854 brought forward—making the total amount to be dealt with £40,285. The Directors stated that they considered the position of the Company to be satisfactory. The turn-over for the year had again been greatly increased; and the value of current contracts and orders in hand exceeded that of any previous year. Several new and valuable channels of business had been opened up; and a great amount of development work in connection with new types of machines had been carried out during the year, necessitating considerable expenditure, all of which had been charged to revenue. The report and balance-sheet were unanimously adopted; and the following dividends were declared: On the original issue of preference shares, 7 per cent. per annum for the half year to Dec. 31 (making 6½ per cent. for the year), less income-tax; on the new issue of preference shares, 6½ per cent. per annum for the period from the date of their issue to Dec. 31 (after taking into account the interim dividend already paid), less income-tax; on the ordinary shares, at the rate of 6½ per cent. for the year ending Dec. 31, less income-tax. In addition to this, £3643 was placed to the preference shareholders' special reserve fund; £8091 was utilized to write off the whole of the preliminary expenses of the Company and one-half of the expenses in connection with the new issue of shares and debentures last year; and £7000 was transferred to the general reserve account. An amount of £7271 was left to be carried forward.

It is stated that the Power Gas Corporation, Limited, have secured an order for a power-gas installation at the shipyard of the China Steam Navigation Company, at Hong Kong. This plant will be capable of producing 300,000 cubic feet of gas per hour, of which 75 per cent., after being specially cleansed, is to be used in four big "Cockerill" gas-engines, and the remaining 25 per cent. utilized in furnaces and other heating appliances.

In moving the adoption of the report and balance-sheet at the eighth general meeting of C. & W. Walker, Limited, last Thursday, the Chairman (Mr. J. F. Wright) said the accounts did not show quite so good a result as for 1904; the profit being £1300 less. They had, in common with others, passed through a very troublous and trying time during the past twelve months. The Directors had had a year of exceptional worry and anxiety. The profit was very far short of what they would all like to see. Yet a profit of £9418, with a disposable surplus of £12,102, which enabled them to pay a dividend and bonus equal to 15 per cent. on the ordinary shares of the Company, and to carry forward considerably more than they did last year, was not one about which they could feel very dejected. Although they compared well with other companies, and a dividend of 15 per cent. was generally looked upon as a matter for rejoicing and congratulation, yet they were not altogether content, and would not be till they saw the profits as good as they were a few years ago. They had, of course, no control over commercial depression or slackness in trade, which brought in its turn fiercer competition; and naturally the profits were bound to go down. But what they could do was to check all unnecessary expenditure, and to see that their methods of production were all that they ought to be. Very considerable economies in standing charges had already been effected. They had put in hand the reconstruction of their foundry. The contracts showed a very great falling off. The work taken this year, however, since Feb. 1, showed a satisfactory increase on that taken during a similar period last year. But it was much too early in the year to be able to form any opinion as to how it might finish up. The item of fixed plant and machinery had gone up by £1200, on account of additions made. The report was adopted; and a dividend was declared of 10 per cent. on the ordinary shares, as well as a bonus of 1s. per share. A resolution that £500 be given to the Directors as extra remuneration for their services during the year was carried, after some discussion. The Chairman mentioned that Mr. Alfred Featherstone was retiring from the post of Managing-Director; but he would remain on the Board.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS MANAGER. Ashford (Kent) Gas Department. Applications by April 19.
HIGH-PRESSURE GAS LIGHTING. No. 4579.
TRAVELLER. W. Sugg & Co.

Plant (Second Hand) Wanted.

CONDENSERS, PURIFIERS, PUMP, AND TANK. Lockerbie Gas Department. Tenders by April 4.
FRACTIONATING STILL. No. 4577.

Plant (Second-Hand) for Sale.

GASHOLDER AND SCRUBBER. Matlock Gas Company.
GAS WORKS PLANT AND COMPLETE SULPHATE PLANT. Hastings and St. Leonards Gas Company.

Engineering Business for Disposal.

LIQUIDATOR. Graham, Morton, Limited.

Stocks and Shares.

PINNER GAS COMPANY. April 14.
MID-OXFORDSHIRE GAS LIGHT AND COKE CO.

TENDERS FOR

Coal and Cannel.

BANGOR GAS DEPARTMENT. Tenders by April 18.
HEXHAM GAS COMPANY. Tenders by April 10.
LYMM GAS DEPARTMENT. Tenders by April 18.

Gasholder.

CARRICK-ON-SUIR GAS COMPANY. Tenders by April 10

Light Oil.

BRIDGEWATER COLLIERIES COKE WORKS. Tenders by April 23.

Pipes, &c.

STOCKPORT GAS DEPARTMENT. Tenders by April 11.

Sulphuric Acid.

COLNE GAS DEPARTMENT. Tenders by April 21.

Tar and Liquor.

COLNE GAS DEPARTMENT. Tenders by April 21.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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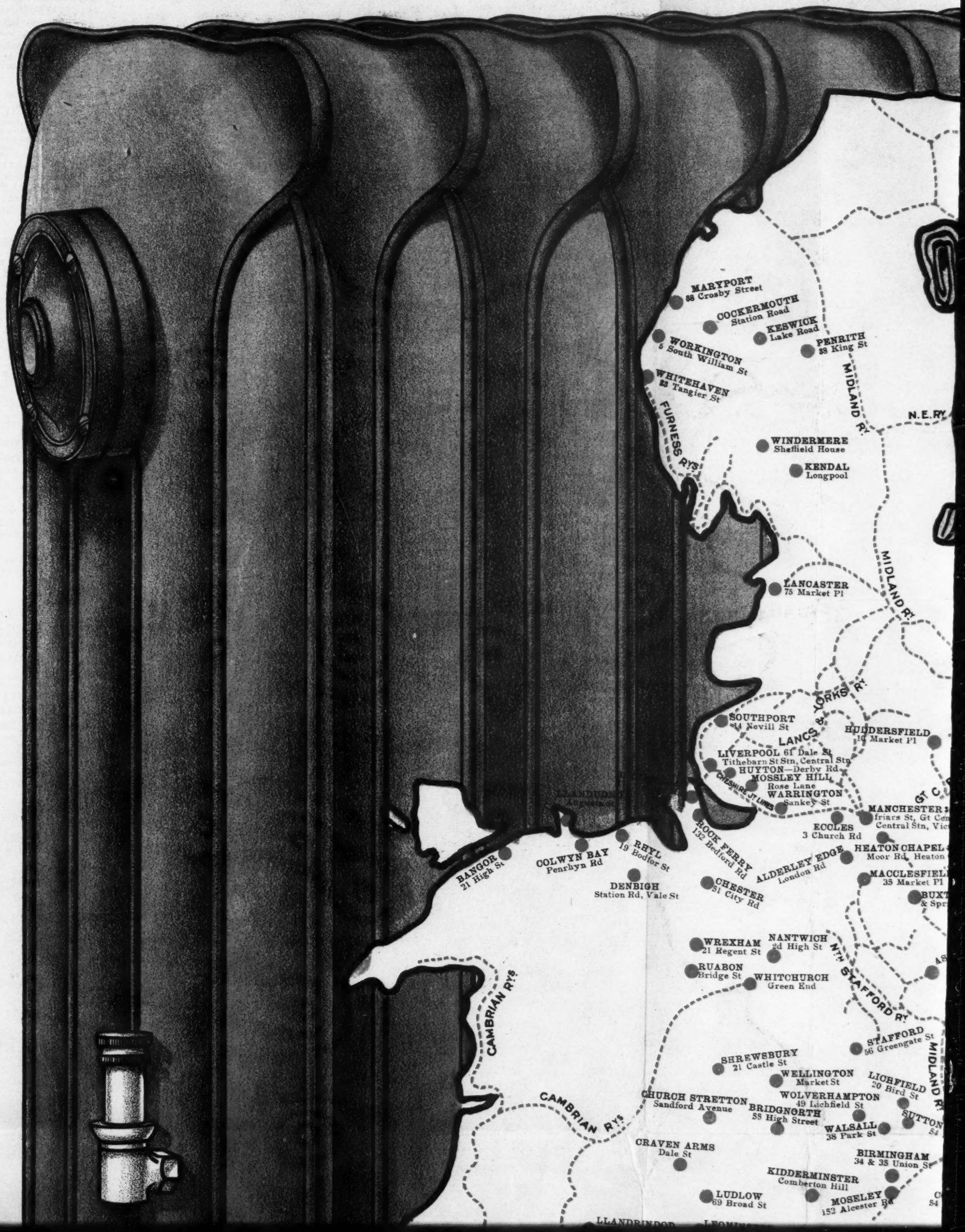
MARYPORT
38 Crosby Street
COCKERMOUTH
Station Road
KESWICK
Lake Road
PENRITH
38 King St
WORKINGTON
5 South William St
WHITEHAVEN
23 Tangier St
MIDLAND R.
N.E.RY.
FURNESS RYS.
WINDERMERE
Sheffield House
KENDAL
Longpool
LANCASTER
75 Market Pl
MIDLAND R.
YORKS R.
SOUTHPORT
44 Nevill St
HUDDERSFIELD
10 Market Pl
LANCS & YORKS R.
LIVERPOOL 61 Dale St
Tithebarn St Stn, Central Stn
HUYTON—Derby Rd
MOSSLEY HILL
Rose Lane
WARRINGTON
Sankey St
CHESHIRE JT LINES
GT. C
MANCHESTER
friars St, Gt Cen
Central Stn, Vict
ECCLES
3 Church Rd
HEATON CHAPEL
Moor Rd, Heaton
MACCLESFIELD
35 Market Pl
BUXT
& Spr
ROOK FERRY
152 Bedford Rd
ALDERLEY EDGE
London Rd
BANGOR
21 High St
COLWYN BAY
Penrhyn Rd
RHYL
19 Bodfor St
DENBIGH
Station Rd, Vale St
CHESTER
51 City Rd
WREXHAM
21 Regent St
NANTWICH
2d High St
NTH STAFFORD RY.
RUABON
Bridge St
WHITCHURCH
Green End
CAMBRIAN RYS.
CAMBRIAN RYS.
STAFFORD
66 Greengate St
MIDLAND R.
SHREWSBURY
21 Castle St
WELLINGTON
Market St
LICHFIELD
20 Bird St
CHURCH STRETTON
Sandford Avenue
WOLVERHAMPTON
49 Lichfield St
BRIDGNORTH
55 High Street
SUTTON
WALSALL
38 Park St
CRAVEN ARMS
Dale St
BIRMINGHAM
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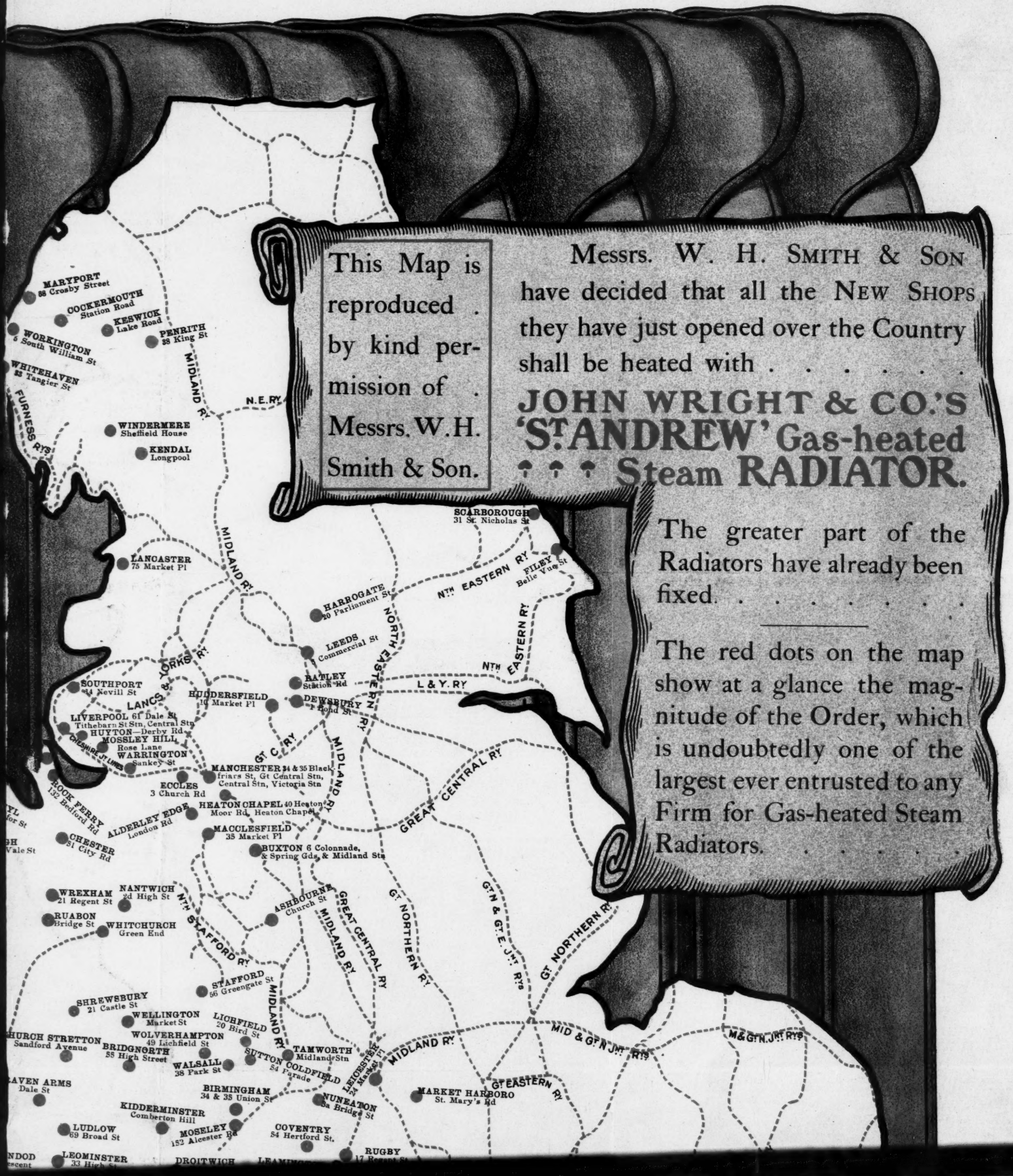
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COCKERMOUTH Station Road
KESWICK Lake Road
PENRITH 88 King St
WORKINGTON 6 South William St
WHITEHAVEN 83 Tangier St
FURNESS RYS
MIDLAND RY
N.E. RY
WINDERMERE Sheffield House
KENDAL Longpool
LANCASTER 75 Market Pl
SCARBOROUGH 31 St. Nicholas St
FILEY Belle Vue St
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DEWSBURY 1 Road St
L & Y. RY
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HUYTON—Derby Rd
MOSSLEY HILL Rose Lane
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CHESHIRE LINES
GT C RY
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MANCHESTER 34 & 35 Blackfriars St, Gt Central Stn, Central Stn, Victoria Stn
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HEATON CHAPEL 40 Heaton Moor Rd, Heaton Chapel
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BUXTON 6 Colonnade, & Spring Gds, & Midland Sta
GREAT CENTRAL RY
CHESTER 51 City Rd
WREXHAM 21 Regent St
NANTWICH 2d High St
ASHBOURNE Church St
GT NORTHERN RY
GT N & GT E JNT RYS
RUABON Bridge St
WHITCHURCH Green End
NTH STAFFORD RY
STAFFORD 56 Greengate St
SHREWSBURY 21 Castle St
WELLINGTON Market St
LICHFIELD 20 Bird St
WOLVERHAMPTON 49 Lichfield St
CHURCH STRETTON Sandford Avenue
BRIDGNORTH 55 High Street
WALSALL 38 Park St
SUTTON COLDFIELD 84 Parade
TAMWORTH Midland Stn
LEICESTER 24 Market Pl
MIDLAND RY
MID & GT N JNT RYS
M & GT N JNT RYS
GT EASTERN RY
MARKET HARBORO St. Mary's Rd
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NUNEATON 3a Bridge St
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LUDLOW 69 Broad St
MOSELEY 152 Alcester Rd
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RUGBY 17 Regent St
LEOMINSTER 33 High St
DROITWICH

CRAVEN ARMS
Dale St
LUDLOW
69 Broad St
LLANDRINDOD
Station Crescent
LEOMINSTER
33 High St
WORCESTER
Hatton Bldgs, St. Nicholas
MALVERN
Belle Vue Lib.
HEREFORD Stonebow Ho,
Commercial Rd
MALVERN LINK
Colston House
CAMBRIAN R'YS
HAVERFORDWEST
Salutation Sq
CARMARTHEN
3 Queen St
LLANDILO
52 Rhosmaen St
ROSS
56 Broad St
TENBY
15 Warren St
LLANELLY
100 Station Rd
ABERGAVENNY
13 Cross St
MERTHYR TYDFIL
91 Pontmorlais
NEATH
143 Windsor Rd
SWANSEA
11 High St
PONTYPOOL
24 Commercial St
ABERDARE
1 Duke St
CHEPSTOW
19 High St
TREDEGAR
5 The Circle
PORT TALBOT
35 Station Rd
NEWPORT, MON
15 Commercial St
BRIDGEND
31 Caroline St.
CARDIFF
6 High St
MIDLAND R'Y
CLIFTON
24 Regent St
CLIFTON DOWN
133 Whiteladies Rd
CLEVEDON
10a Triangle
BATH
WESTON-SUPER-MARE
Hereford Ho, Walliscot Rd
ILFRACOMBE
1a Fore St
FROME
12 Stony St
BRIDGWATER
S & D Statn
TAUNTON
Station Rd
TIVERTON
38a Gold St
YEOVIL
78 Middle St
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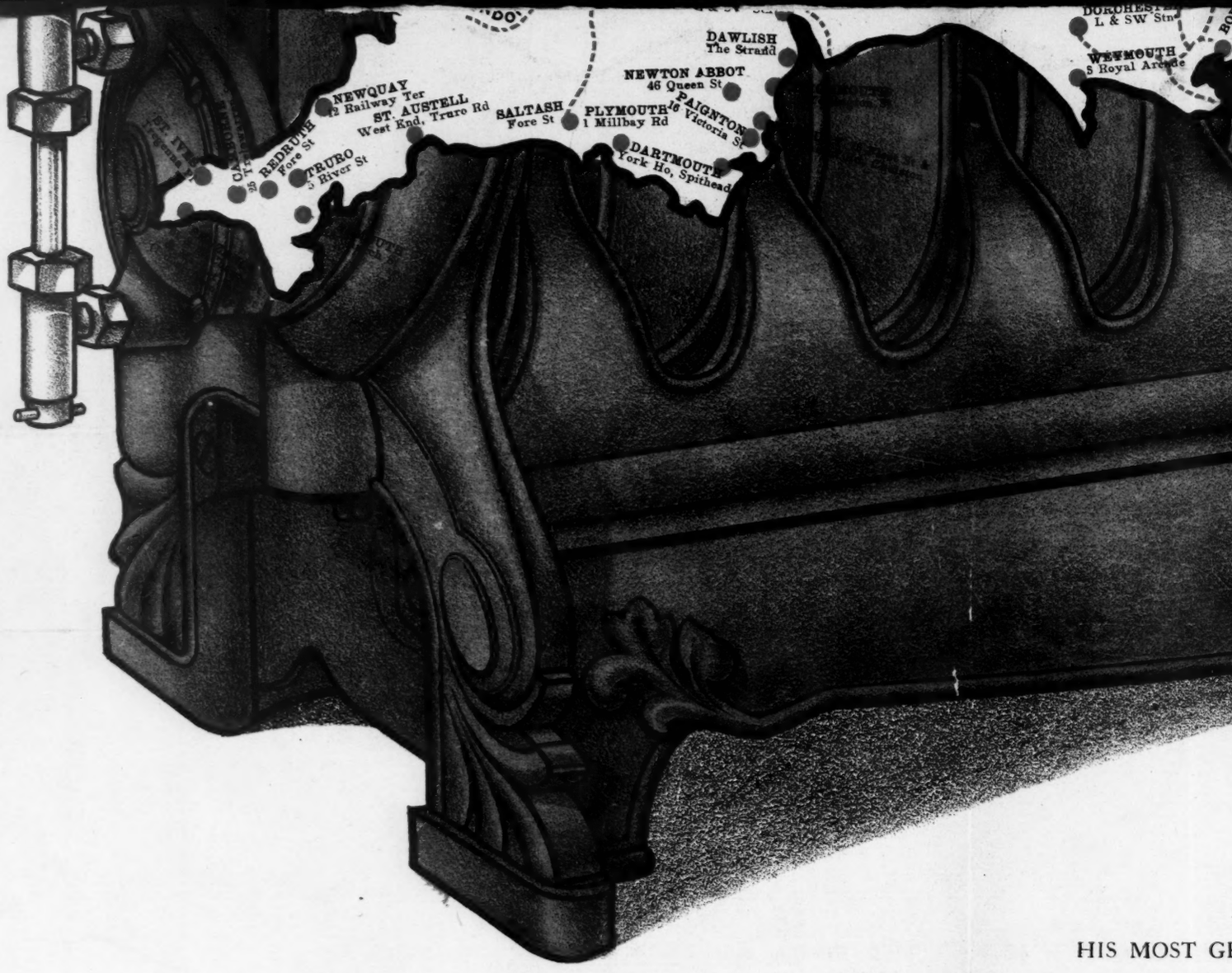

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Shoolbred and Co.
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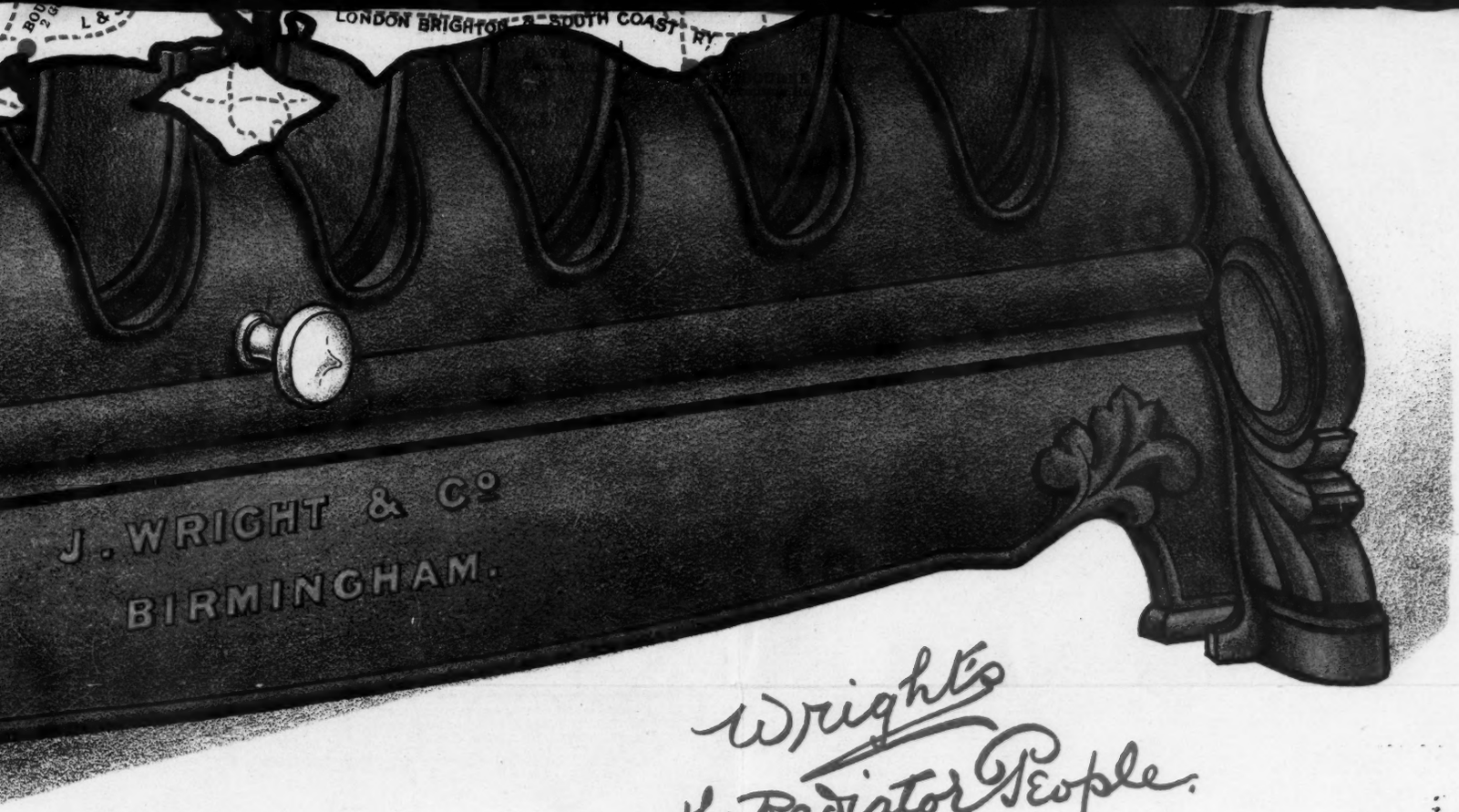

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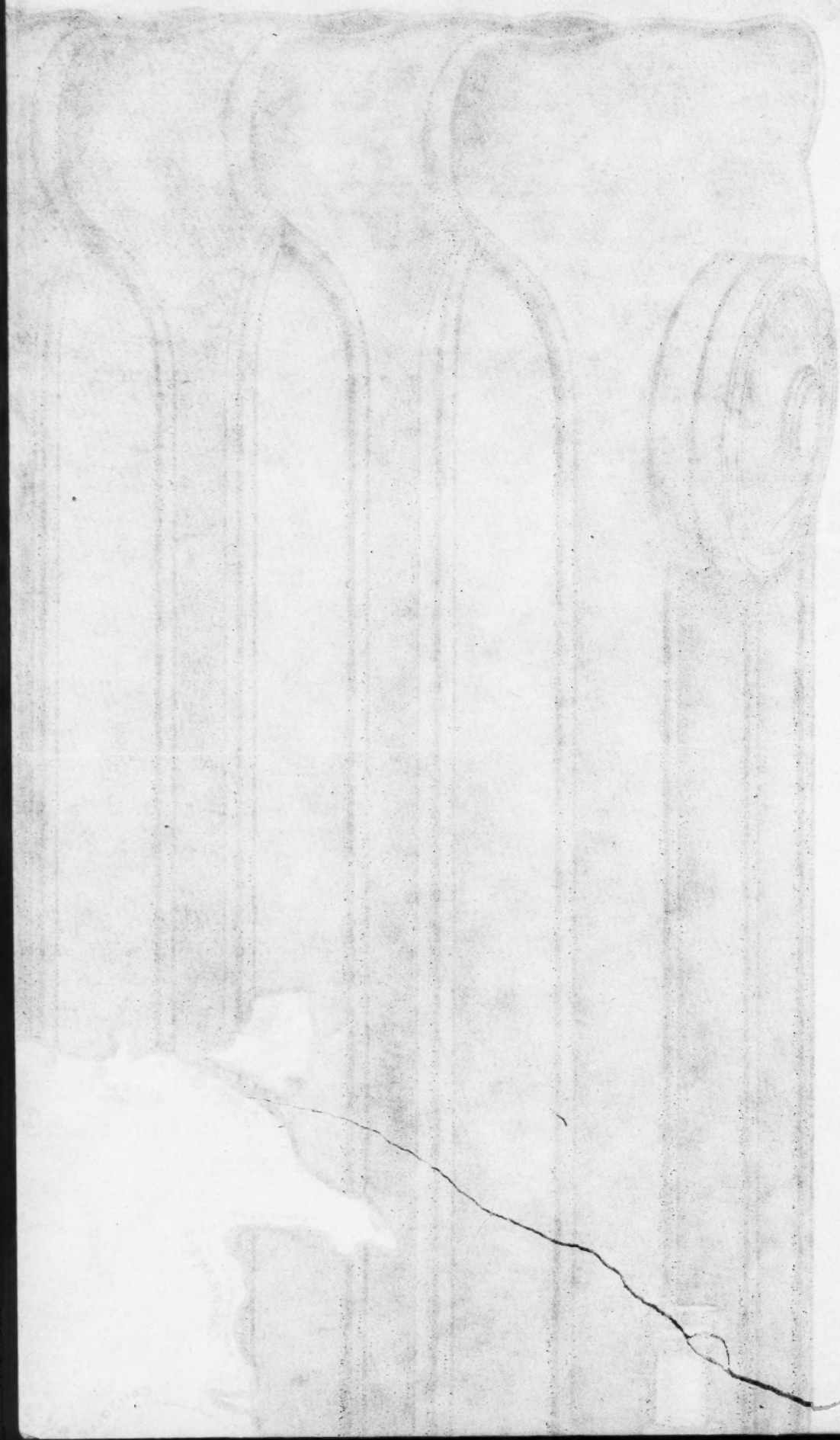
And at the HOUSES OF PARLIAMENT.

Fleet Street, in the City of London.—*Tuesday, April 3rd, 1906.*



ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

GAS TAR wanted.
Brotherton and Co., Ltd., Tar Distillers. Works: Birmingham, Glasgow, Leeds, Liverpool, and Wakefield.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

"VITERNUS" METALLIC PAINT FOR GAS-WORKS PLANT.
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SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
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MEADE-KING, ROBINSON, & CO. Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 8, Exchange Street, Manchester, and 11, Old Hall Street, Liverpool.

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PAINTING Work for all kinds of Gas-Works Plant, Roofs, Bridges, &c., undertaken by Contract or otherwise.
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SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
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THE Water and Gas Debenture Share Investment Trust, Limited, of 37, High Street, Tunbridge Wells, are prepared to Invest £10,000 Capital in above, and also to Underwrite Progressive Water and Gas Companies' issues.

TAR AND LIQUOR WANTED.
Best Prices paid.
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HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
Read Holliday and Sons, Ltd., Huddersfield.

GAZINE—A radical Solvent and Preventative of Naphthalene deposits, which has been used for many years on the Continent for the cleaning of Mains and Services, and is now being adopted in England. It is also used for the Enrichment of Gas, and has an Illuminating Value of double that of 90 per cent. Benzol.
Supplied by C. Bourne, 120, Manor House Road, Newcastle-on-Tyne.

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APPLICANTS for the position of District Inspector in a large Suburban Gas Company, advertised under No. 4574, are THANKED and informed that the post has been FILLED UP.

APPLICANTS to No. 4571, care of Mr. King, for the position of Gas Engineer in British Colony, are THANKED, and informed that the APPOINTMENT HAS NOW BEEN MADE.

REPRESENTATIVE wanted for Midlands and North, by Manufacturers of High-Pressure Gas Lighting Plant. Knowledge of Ventilating and Heating will be an additional recommendation.
Apply, by letter, to No. 4579, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

A LONDON Firm of Gas Engineers require a TRAVELLER to travel in the Midland District; also one for Manchester and N.W. of England. He must have a good connection among Gas Companies, Local Authorities, Engineers, and Architects.
Apply, by letter, stating Age and Salary expected, to William Sugg and Co., Ltd., Regency Street, Westminster, S.W.

URBAN DISTRICT OF ASHFORD (KENT).

THE Urban District Council of Ashford (Kent) invite APPLICATIONS for the position of GAS-WORKS MANAGER. Candidates must have had Practical Experience as Manager or Assistant Manager of a medium sized Gas-Works. Any Candidate canvassing members of the Council will be disqualified.
Applications, endorsed on envelope "Gas Committee," with *copies* of not more than Three recent Testimonials (which will not be returned), and stating Age, Experience, and Salary required, to be addressed to and reach me not later than the 19th of April, 1906.
John Creery,
Clerk.
11, Bank Street,
Ashford, Kent.

WANTED, a Fractionating Still for Benzol and Toluol.
Write, giving full Particulars, to No. 4577, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GAS-MAIN Pipes, Clean and Perfect, Second-Hand 10-inch, 8-inch, 6-inch, 5-inch. Large Stock, drawn from Sockets, no broken ends, from £3 10s. to £4 10s. delivered, according to distance.
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GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. Blakeley, Gas Engineer, Thornhill, Dewsbury.

MATLOCK AND DISTRICT GAS COMPANY.

TELESCOPIC Gasholder for Sale, 43 ft. 6 in. and 45 ft. diameter, each Lift 10 ft. deep and spiral-guided.
Also SCRUBBER, 3 ft. 6 in. diameter, 23 ft. 6 in. high, in Five Cylinders.
The Holder and Scrubber may be seen in use at the Gas-Works, Matlock.
Offers to the Secretary, Robert Hall, Esq., Gas Offices, Dale Road, Matlock.
Thomas Brown,
Manager.
Gas-Works, Matlock,
March 27, 1906.

GAS PLANT FOR SALE.

THE Hastings and St. Leonards Gas Company, having transferred the Manufacture of Coal Gas to their new Glyne Gap Works, have for DISPOSAL a quantity of GAS-WORKS PLANT in good working order. The Plant consists principally of Retort-House Fittings, Roofs, &c.; also a complete SULPHATE PLANT.
Inquiries are solicited by Mr. C. E. Botley, Engineer and General Manager, Gas Company's Offices, Hastings, who will be glad to furnish specific details.
March 2, 1906.

BOROUGH OF LOCKERBIE.

THE Gas Committee invite Offers for the supply of the following Good Second-Hand PLANT required by them—
CONDENSERS, having 8-inch connections, complete with Bye-Pass, capable of dealing with 80,000 cubic feet per day.
Two PURIFIERS, 8 feet square, with Grids and Valves complete.
One Steam Tar and Liquor PUMP, with 2-inch or 2½-inch suction and delivery.
One Cast-Iron Rectangular TANK, capacity of about 1000 or 1500 gallons.
Offers for the above, all or part, to be sent to Mr. David McJerrow, Town Clerk, Lockerbie, not later than Wednesday, the 4th of April, endorsed "Gas Plant."
Further Information, if required, may be had from Mr. R. W. Cowie, Gas Manager, Lockerbie.

CARRICK-ON-SUIR GAS COMPANY, LIMITED.

TWO-LIFT Gasholder required, about 30 feet diameter.
Forms of Tender, Drawings, Specification, Terms of Agreement, Conditions of Contract, Quantities, and all Particulars may be obtained from the undersigned, the Company's Engineer, on payment of Half-a-Guinea.
Tenders to be submitted on or before noon on Tuesday, the 10th of April, 1906.
R. B. Anderson.
5, Westminster Chambers,
London, S.W.

BRIDGEWATER COLLIERIES COKE-WORKS.
(The Earl of Ellesmere.)

TENDERS are invited for the Light OIL produced at the above Works for a period of Six or Twelve Months from the 1st of May, 1906, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley branch of the Lancashire and Yorkshire Railway; or at the Brackley Siding on the Little Hulton Mineral branch of the London and North-Western Railway.
Tenders, endorsed "Tender for Light Oil," to be addressed to Mr. Thomas M. Brown, Bridgewater Coal Office, 4, Chapel Walks, Manchester, on or before the 23rd of April, 1906.
Manchester, March 23, 1906.

HEXHAM GAS COMPANY.
TENDERS FOR COAL.

THE Directors of the above Company are prepared to consider TENDERS for the supply of 5000 to 6000 Tons of unscreened GAS COAL, to be delivered as directed at Hexham Station, between June 1, 1906, and June 30, 1907.
Tenders to be forwarded to the undersigned not later than April 10, 1906.
Herbert Lees,
Engineer and Secretary.
Gas Offices, Hexham,
April 2, 1906.

BANGOR CORPORATION.

THE Gas Committee invite Tenders for the supply of 5000 Tons of best screened GAS COAL, delivered free on rail, Bangor Station (L. and N.W. Railway), between June 1, 1906, and July 31, 1907, in such quantities, monthly, as required.
The Gas Committee reserve the right to divide the quantity between two or more Contractors.
The lowest or any Tender not necessarily accepted.
Ferms of Tender may be had from the undersigned.
Tenders must be on the prescribed Forms and accompanied by Analysis, and addressed to the Chairman of Gas Committee, Gas Office, Bangor, N. Wales, on or before April 18, 1906.
John Smith,
Manager.
Gas-Works, Bangor, N.W.,
March 28, 1906.

BOROUGH OF COLNE.
(Gas Department.)

TAR AND SULPHURIC ACID.

THE Gas Committee invite Tenders for the purchase of the surplus TAR made at their Works during the Twelve Months ending March 31, 1907; also for the supply of SULPHURIC ACID used in the Manufacture of Sulphate of Ammonia during the same period.
Particulars may be obtained on application to the undersigned.
Sealed Tenders, endorsed "Tar," or "Acid," must be addressed to the Chairman of the Gas Committee, Gas-Works, Knotts Lane, Colne (Lancs.), and delivered not later than Saturday, April 21, 1906.
Fred Thorpe,
Engineer and Manager.
Gas-Works, Knotts Lane,
Colne (Lancashire),
March 30, 1906.

COUNTY BOROUGH OF STOCKPORT.

TO IRONFOUNDERS.

THE Gas Committee are prepared to receive TENDERS for a supply of 3-inch and 4-inch CAST-IRON MAINS and for IRREGULARS from 3-inch to 8-inch.
Specifications and Particulars can be obtained from the Engineer, Mr. S. Meunier.
Tenders, endorsed "Mains," must be addressed to the Chairman of the Gas Committee, and be delivered at the Town Clerk's Office, on or before April 11 next ensuing.
No Tender will be accepted without satisfactory proof that the firm tendering pays the Trade Union rate of wages and observes the Trades Union number of hours as are usually paid and observed in the district where the goods are made or produced.
The Committee do not bind themselves to accept the lowest or any Tender.
By order,
Robert Hyde,
Town Clerk.
March 30, 1906.

URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to receive TENDERS for the supply of CANNEL and best screened GAS COAL, to be delivered at their Gas-Works in Lymm, for a term of Twelve Months from the 1st day of July, 1906.
The probable quantities required will be about 100 Tons of Cannel and about 1800 Tons of Gas Coal, which must be freshly wrought, well screened, and free from Sulphurous Pyrites and other objectionable matter; but the Council reserve the right of increasing or decreasing the quantities named.
The person whose Tender is accepted will be required to enter into an agreement with the Council for the due performance of his Contract.
Sealed Tenders, stating price per ton delivered by Boat alongside the Works, to be sent to the undersigned on or before the 18th day of April, 1906, and endorsed "Coal Tender."
The Council do not bind themselves to accept the lowest or any Tender.
Forms of Tender are not supplied.
Further Particulars may be had on application to the Gas Manager, Mr. W. L. Donaldson.
W. Mullard,
Clerk.
Council Offices, Lymm,
Cheshire, March 30, 1906.

Re GRAHAM, MORTON, LIMITED, IN LIQUIDATION.

FOR SALE, as a running concern, the Engineering Business carried on by the above Company. The Works were built about Two Years ago, and are situated in the Engineering District of the City of Leeds. They cover an area of upwards of 4½ Acres. The area covered by the bays of the works is 7000 square yards. There is a Railway Siding connected with the Great Northern Railway running direct into the Works. There are Two Belliss and Morcom Engines and Dynamos of 150-horse power each. There is also a Set of large Hydraulic Pumps and Accumulators. The Hydraulic pressure is 200 pounds per square inch. There is a separate Dynamo Engine for lighting the Offices, and also sufficient Boiler power for driving the above Engines. Electric current is generated throughout the Works. There are Four 10-ton Cranes and One 6-Ton Crane working inside the Works, and One 10-ton Crane working on the Gantry outside.

For further Particulars and Orders to view, apply to the Liquidator, Mr. ROBERT HILDITCH, (Armitage and Norton, Chartered Accountants), at the Works, Pepper Road, Hunslet, LEEDS.

PINNER GAS COMPANY, LIMITED.

SALE BY TENDER OF 600 "B" SHARES OF £5 EACH.

MINIMUM PRICE, £6 15s. PER £5 SHARE.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER 600 "B" Shares of £5 each; being a portion of the Additional Capital authorized by the Pinner Gas Order, 1901.

The Shares will be allotted to the highest bidders; but no Tender will be accepted at a lower price than £6 15s. per £5 Share.

The Standard rate of dividend authorized for these Shares was 7 per cent. per annum, which was the rate paid last year; but the sliding-scale is now applicable, and the price of Gas has been reduced, and is about to be further reduced, and it is quite expected that a greater dividend will be paid for the current year, and a further increased dividend next year.

No Tender will be received after Twelve o'clock noon on Saturday, the 14th day of April, 1906.

Particulars and Forms of Tender can be obtained on application to the Secretary.

By order,
WM. WMS. BOX,
Secretary.

28, Great James Street, Bedford Row,
London, W.C.,
March 16, 1906.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

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JOHN HENRY BREARLEY, and
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CANDLE SAFETY LAMPS.

Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

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Rich in Illuminating Power and yield of Gas Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

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Telegrams: "Illuminate, London."

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MIRFIELD GAS COAL
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.

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STAFFORDSHIRE TUBE CO., LIMITED,
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Manufacture and keep in Stock at their Works (also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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THE SUBSCRIPTION LIST

OF THE

MID-OXFORDSHIRE GAS LIGHT & COKE CO.

(LIMITED)

(AMALGAMATION OF GAS UNDERTAKINGS),

IS NOW OPEN.

The Company offers for Subscription at par—

£15,000 Five per Cent. Debenture Stock, Redeemable at Seven and a half per cent. Premium (or at £10 15s. per £10 Stock) in Five Years from the date of issue, or at the option of the Company upon six months' notice. (Part of an authorized issue of £25,000.)

2000 Five and a Half per Cent. Preference Shares of £10 each, and

2000 Ordinary Shares of £10 each.

Trustees for the present issue of Debenture Stock:

ABRAM CRESWICKE RAWLINSON, Director of the Metropolitan Bank (of England and Wales), Limited, and Chairman of the Chipping Norton Gas and Coke Company, Limited, The Elm, Chipping Norton.

EDWARD PRESCOTT, late Chairman of the Woodstock Gas Light, Coke, and Coal Company, Limited, Woodstock.

The Debenture Stock will be registered and transferable in sums of not less than £10, and the interest thereon will be payable half-yearly on the 24th day of June and the 24th day of December. A full six months interest on the amount paid up on the Debenture Stock will be paid on the 24th day of June next.

The present issue is for the purpose of providing the necessary capital to complete the purchase of several Gas undertakings and to carry out certain improvements and enlargements, so as to bring the works and mains up-to-date, to introduce the general use of slot meters, cookers, and gas-stoves, and to improve the public and private lighting; also to defray the expenses of an application to Parliament in the present Session.

THE MID-OXFORDSHIRE GAS LIGHT AND COKE COMPANY, LIMITED,

has been formed for the purpose of amalgamating various Gas undertakings in the County of Oxford; these works have hitherto been carried on as separate undertakings, but it is now proposed to consolidate them under one central local management, thereby effecting considerable economy in working expenses and establishment charges.

Prospectuses and Application Forms can be obtained from

THE METROPOLITAN BANK (OF ENGLAND AND WALES), LIMITED, Oxford, Chipping Norton, Charlbury, Bampton, and Branches, Head Office, Birmingham, and at 60, Gracechurch Street, London.

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Messrs. TUBB & CO., Bankers, Bicester,

Or at the **Central Office: 8, NEW ROAD, OXFORD;** or will be sent by post on receipt of a telegram or letter.

H. BANYARD, Secretary (pro tem).

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FOR GAS ENGINEERS AND MANAGERS

(DEDICATED TO SIR GEORGE LIVESEY).

The Work has been revised throughout, and contains 40 pages of Letterpress and 12 Illustrations more than the last Edition.

In almost every department additions have been made; and it is believed that the labour bestowed on its production will enhance the value of the book as a Work of Reference.

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The Flow of Gases & Proportioning Gas Mains

Four Diagrams (with Explanatory Pamphlet) for determining at a glance the various Problems involved in Proportioning Gas Mains and Services to suit the varying conditions of Diameter, Length, Pressure, Specific Gravity, and Discharge, with Notes as to the allowances to be made for Bends, Branch Mains, and other Disturbing Influences.

By F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E.

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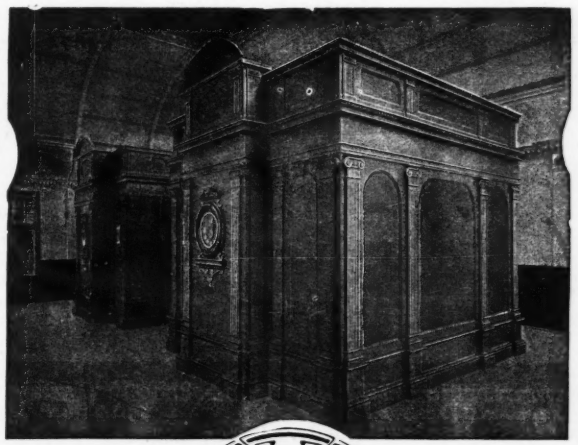

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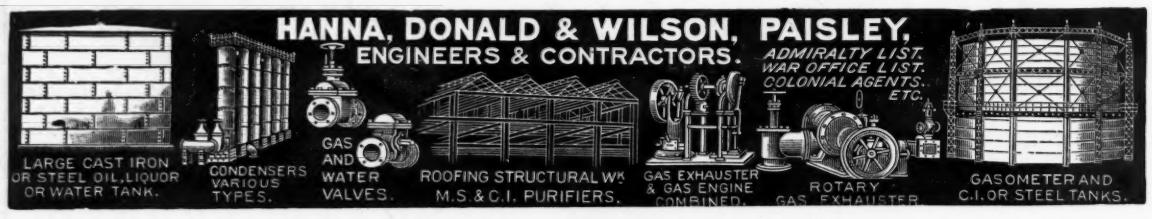
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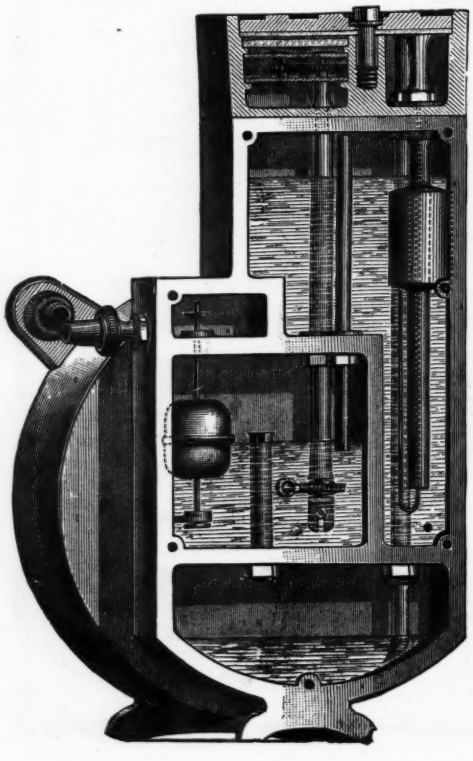

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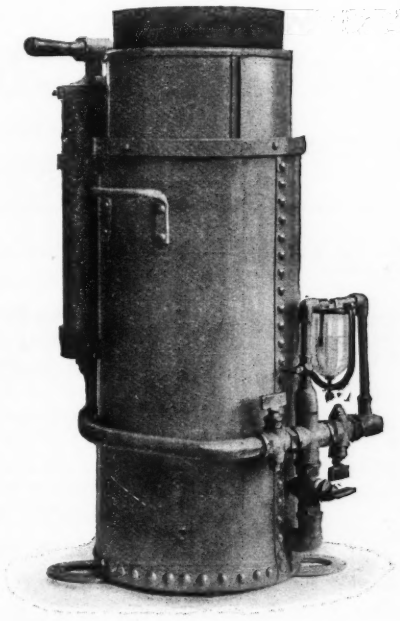

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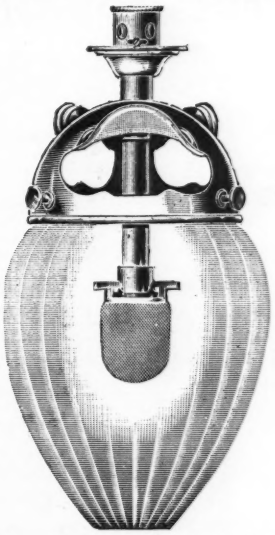

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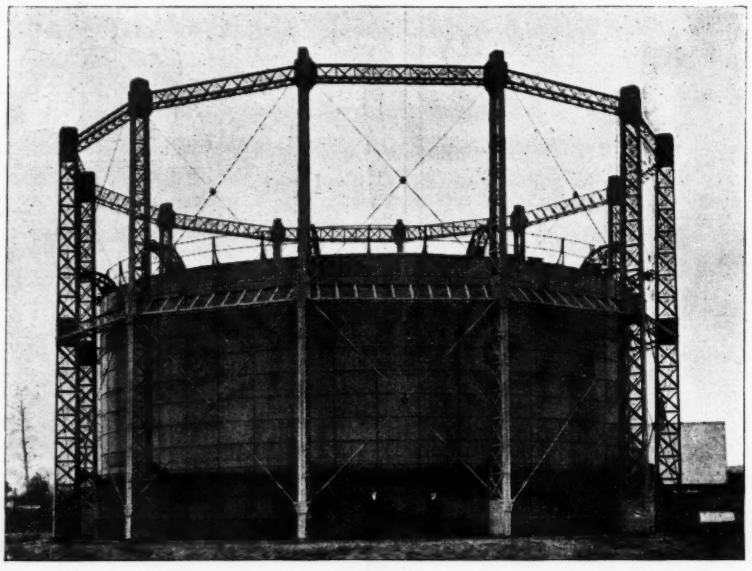

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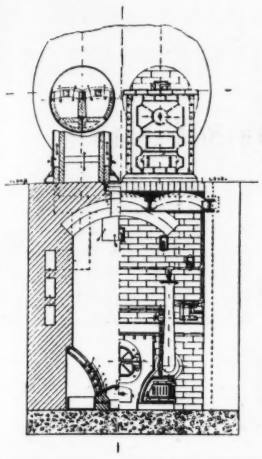

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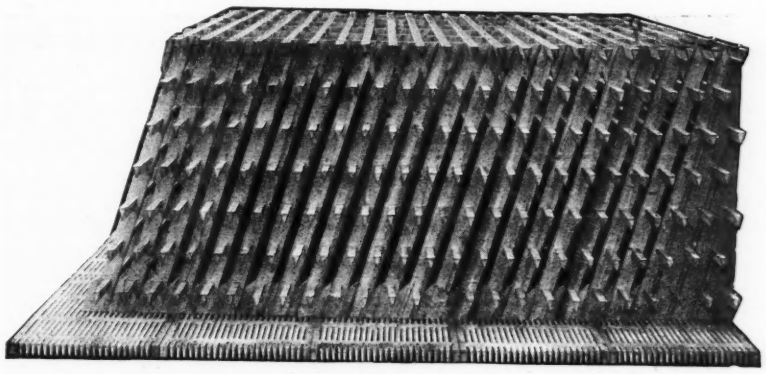

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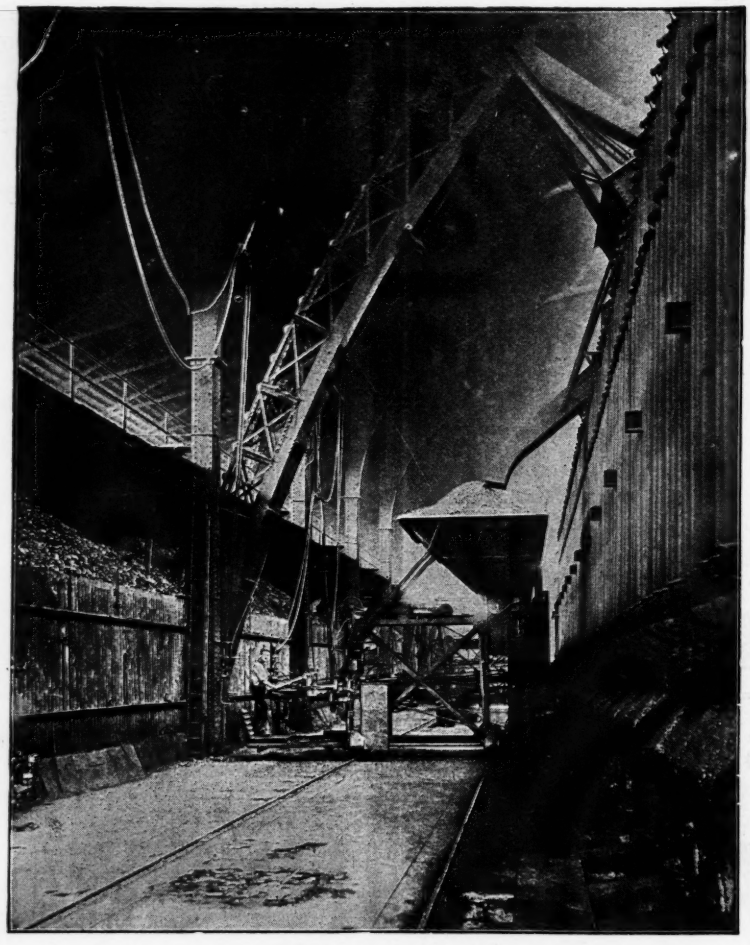

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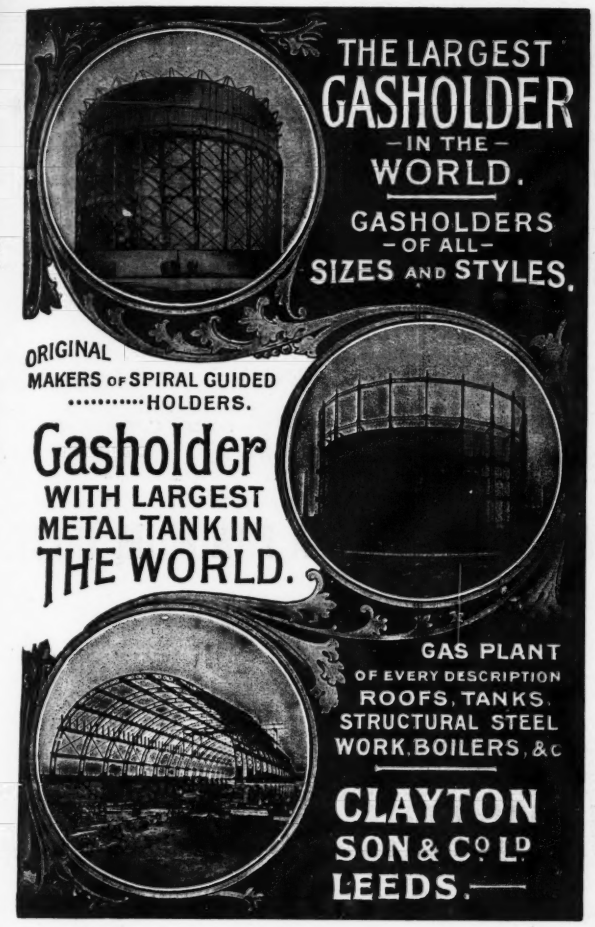

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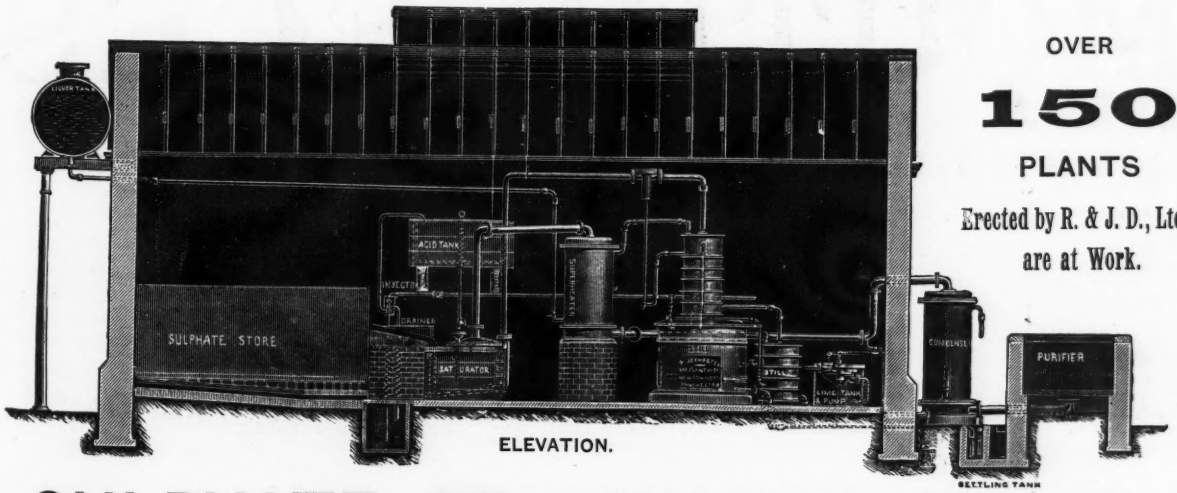

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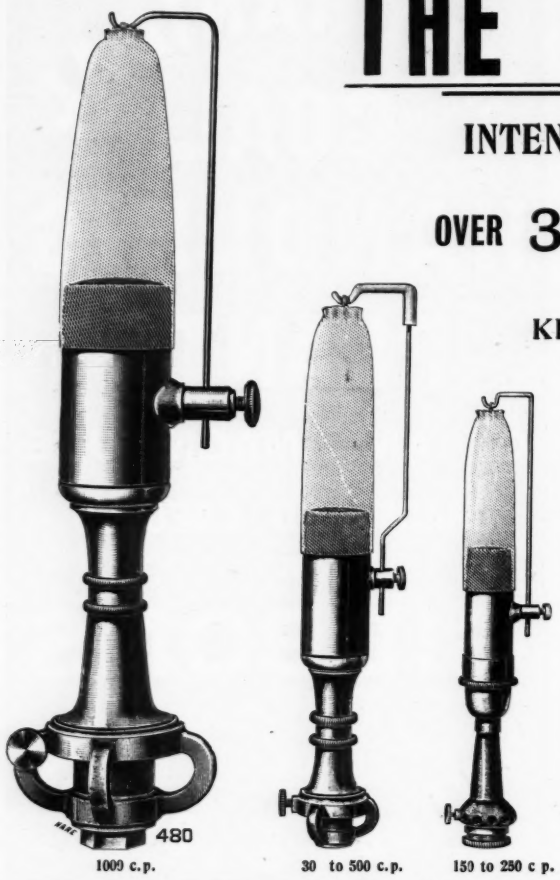

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